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JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE PROMOTION OF THE MECHANIC ARTS.

DEVOTED TO

MECHANICAL AND PHYSICAL SCIENCE,

Civil Engineering, the Arts and Manufactures,

AND THE RECORDING OF

AMERICAN AND OTHER PATENT INVENTIONS.

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JULY, 1858.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Grand Trunk Railway of Canada.

We have been favored by Captain L. A. Huguet-Latour, of Montreal, Canada, with a copy of the official statements, reports, and accounts of the railway aforesaid, laid before the Legislative Assembly, of Canada, in 1857, by Hon. W. Cayley, Inspector General.

Some points in this official document are well worthy of the notice of the engineering readers of our *Journal.*

This great work (now nearly completed) will stretch in a continuous line and with unbroken gauge, (5½ feet,) from Port Sarnia, at the outlet of Lake Huron, to the Harbor of Portland, in the State of Maine, forming with its Quebec branch, a connected railway of 1112 miles in length, all under an undivided management, and worked by a single corporation, with an investment already exceeding *fifty millions of dollars.*

We now invite attention to a few interesting items of detail.

1. *Renewal of Rails.* Upon the sections opened but recently, the replacement of broken and injured rails has already reached a ratio of 1 in 500—whilst upon those portions of the eastern section which have been in operation for six or seven years, the present annual ratio of replacement of rails is 1 in 30. The rails for renewals have been obtained under contract with a Boston rail-mill at £5 sterling (say $25,) per ton, the contractor supplying a ton of new for every ton of old sent to the mill, and the company bearing the transportation to and fro.

The Chief Engineer, (A. McKenzie Ross, Esq.,) thinks for the present, this arrangement cannot be improved, as far as concerns the Portland section; but for the 750 miles in Canada, where the ordinary wear and tear will require the re-rolling of 60 tons per week, or 3000 tons per annum,* he recommends the establishment of a company rail-mill, which, in his estimation, will save $75,000 annually.

2. *Lighting of the Central Work-shop.*—The gas for the 700 lights now required at the establishment at Point St. Charles, is furnished by the Montreal Gas Company, at, say $3 per 1000. The Chief Engineer considers this exorbitant, and recommends the Company to make their own gas, which he is confident they can do at $1·80 per 1000, or forty per cent. reduction, and that the cost of the necessary works would not exceed $20,000.

3. *Repairs of the Permanent Way*—Have been contracted for upon 856 miles of line, in eight contracts, to run three years each, at an average of something less than $500 per mile per annum, exclusive of iron, and in effect of bridges also—these being of a permanent character.

The above items are gathered chiefly from the Report of the Chief Engineer, and they indicate on the part of that skilful officer, a general opinion, that great railway corporations like the Grand Trunk of Canada, would find it to their interest to supply themselves with materials from manufactories of their own to a great extent.

We come now to notice a Report by Messrs. Keefer & Shanly, (engineers of the Grand Trunk Railway,) deputed to examine specially, the bridges of the eastern section, and, as it is almost wholly devoted to the *wooden bridges* of the Montreal and Portland Division, constructed chiefly by American engineers, it is valuable to us as a shrewd criticism, by two skilful Canadian engineers, (familiar with English works,) upon a certain mode of bridge construction, in common use on very many of the railways of the United States, and while we admit generally, the propriety of the observations made by these able officers, we will note for the consideration of our readers a few exceptions.

Of Wooden Bridges.—Upon the Montreal and Portland Division, (says this Report,) there are now 55 wooden bridges, in all, 9355 feet long—all, with a single exception, "Howe Trusses without arches."

These bridges at the date of this Report were from four to eleven years old—the earliest having been built in 1846, the latest in 1853.

"The old or first set of bridges are in various conditions of safety, or of insecurity, and demand constant and careful inspection to maintain them in a reliable manner.

"Those which were covered in shortly after they were built, are in a pretty good state of preservation. The painting and decking of others, without covering the sides, has been but *an imperfect protection;* but all of them were too lightly timbered in the first instance to endure for any length of time the great strain to which they are continually subjected, and for this reason, and in some instances from inferior workmanship and materials, have given indications of premature decay and failure.

*Experience in the United States on railways of active trade conclusively proves, that the above is an *under-estimate,* and that the quantity required for the annual replacement of 750 miles of railway, would, at an average, *far exceed* the amount stated.

"The *unprotected ones* have failed more rapidly, and some of them are now propped up on bents.

"The large bridge over the Richelieu, at St. Hilaire, was only painted and decked—not covered in—and although strengthened by an arc* two years since it is now in an unsafe condition, and should be replaced without delay. It was built in 1846, and had it been properly protected at that time, would have lasted many years longer.

"Several other bridges are in the same unsatisfactory condition, and must be re-built this season, (1857,) without loss of time. There are others, again, that must be replaced in one, two, three and ten years, and none of the old bridges, however well protected, can be expected to last more than five or six years longer, under the very heavy traffic which they will have to sustain.

"The condition of these bridges may be taken as a sufficient proof, that for the purposes of a first class railway—such as the Grand Trunk—*wooden bridges are but a temporary adaptation*, and should never be *replaced* with wood, except in cases of necessity, when, as in the present instance, (with regard to some of these,) it will be impossible to procure and put up *iron*, within the time they are absolutely required. *Unprotected bridges* submitted to heavy traffic, especially where coupled engines are used, will not last out *more than five or six years*,† and those *which are covered and properly cared for may last twenty years*;‡ but they are all liable to be burned up, and so for a time put a stop to business—which might cause more damage to the company on that account, than the entire cost of the bridge itself.

The Report goes on—

"We therefore consider it the interest of the company, and strongly recommend that arrangements should be made for having all *the wooden bridges* replaced by iron tubes or girders.

"Taking the whole line through, the cost of iron bridges will be (on 7835 feet run,) a little more than *double* that of wood, but in the single instance of the Richelieu bridge the cost will be a little less than *three times*.

"There are some bridges, however, which must be rebuilt at once in wood, and for these, we consider the best form for strength and durability is the '*Burr arch and truss bridge*.' It is a form which has stood the test of time, and is generally acknowledged to be the most reliable and satisfactory. No (wooden) truss of large span is suited for railway purposes, unless combined with the *arch*, and the condition of the bridges on this line may be considered as confirmatory of this statement."

In concluding these extracts from the brief but able Report of Messrs. Keefer & Shanly, (Canadian engineers of reputation,) we desire to add a few remarks upon the last paragraph, in which we fully concur.

While a majority of our American engineers will undoubtedly endorse the "Burr Bridge," and nearly all allow the *utility of arches*, yet we see very many of these gentlemen admitting in their works, flimsy rectangular trusses (without arches,) under various patents, which their judgment can hardly approve, and which we hope may be more generally condemned in future, by the body of our engineers—as they have already been by many of the most enlightened members of that honorable and useful profession. M.

* It is a singular fact, that although the American engineers have always promptly resorted to "*arches*" to sustain a failing bridge, many of them have manifested an inconceivable repugnance to the use of "*arches*" as an integral portion of original structures.

† To this observation, we regret we cannot assent—a properly constructed bridge of suitable materials, even if *unprotected*, except by *white-wash*, may be fully relied on for *ten years*, and we could point to a light "Howe Truss," built of Susquehanna white pine, (in use upon a railway,) now twelve years old, and yet in fair condition.

‡ There are so many instances of much greater durability of covered bridges in the United States, that this proposition cannot be acquiesced in. "*Burr Bridges*," properly constructed and carefully covered, have been in use with double track railways and heavy trade for *twelve years*, and show not the least symptom of failure—while the famous bridge at Trenton, on the Delaware, (in spans of 200 feet,) was built fifty years ago, is still in excellent order, and for a dozen years has borne a railway track!

For the Journal of the Franklin Institute.

*On the Absolute Power of Steam, and the most Convenient Method of Ascertaining it; more Particularly in Reference to its Effective Working, when applied Differentially in the Steam Engine, and Condensed with Hot Water.** By Thomas Prosser, Civil Engineer, New York.

The power of steam is to the multitude like that of some mythic gnome, unlimited; while, in the books, it is so overlaid with formula, as to be little better than a myth to ordinary engineers, who are seldom familiar with mathematical calculations, and have not the patience to await the unravelment of a long string of x's, y's, and z's. How else are we to account for the numerous inventions, even of tolerably well educated men, which promise impossibilities in the way of using steam, which promise to obtain from it more mechanical power than exists in it? There are innumerable instances of such inventions, which, had the inventors been aware of the absolute power of steam—beyond which it is impossible to go—would never have been heard of.

That the knowledge required, is in the books, may be true, but it is not made manifest, and the elaborate tables are more calculated to mystify than to place the fact in bold relief.

We are supposed to know something about the weight of water which one pound of coal will evaporate—that is something—it varies, perhaps, between 5 and 9 lbs.—not very definite truly, but according to Mr. McElroy, Vol. xxxv, p. 239, of this *Journal*, it is questionable if the range is wide enough, for, coal used for *experimental purposes*, appears not unfrequently to have been taken by the *barrow full*, for a bushel, and again transposed, and called so many pounds. 84 lbs., according to Farey, was usually considered a bushel; then it got to be 88 lbs. in calculations, and now it is 94 lbs., or somewhere between 80 and 112 lbs. Again, the evaporation of the water has usually been calculated from the capacity of the cylinder of a steam engine, which gives no record of the steam which is condensed therein. And this, then, is the *practical* way of testing the power of a steam engine and boiler—the steam being measured by the *cylinder full*, and the coals by the *barrow full*.

Now, it appears to me, that what is required is a "*standard*," which readily conveys to the mind something definite, so far as our present knowledge extends of the absolute power of steam. For instance, one pound of water converted into steam under a certain weight, expands and lifts that weight so many times its own height. Here we have the absolute power *put into* the water to convert it into steam, and of course we can obtain no more out of it. If the height of the pound of water is one foot, then the product of the weight lifted in pounds on that "Standard Base," by the height which it is carried in feet, (being equivalent to the volumes of steam which one volume of water is converted into,) gives the "Standard Power." Mr. McElroy, before

*More fully explained in Volumes xxxi, xxxiii, xxxiv, and xxxv, of this Journal.

referred to, has shown how little reliance can be placed upon the Cornish pumping engine's returns of the duties of the coal. He has omitted, however, to state the expansion with which the Brooklyn pumping engine is intended to work, to give a duty of "600,000 lbs. raised one foot with one pound of coal." That knowledge is necessary, because the whole mechanical power in the steam, deducting the ordinary back pressure in the condenser, is but about equal to the effective power guaranteed, providing that one pound of coal evaporates 10 lbs. of water, which is very improbable. Even this amount of duty is but about the average reported of the Cornish engines, and some reports have even exceeded twice as much. Without knowing with what expansion the engines are worked, it is not possible to tell whether the duty reported exceeds the power of the steam or not. The tables now in use are not sufficiently correct for the purpose to which I have intimated a desire to apply them, as more than fifty years have elapsed since the experiments were made, which constitute the basis of our calculations of the density of steam. Since that time, other experimentalists have entered the same field of science, and foremost among them we place M. Regnault,* who has proved, beyond any reasonable doubt, that the whole basis is very considerably in error as regards the relations which the temperature bears to the elastic force of steam; and also, that the dilatation of dry gaseous bodies, and by inferences of dry steam also, varies from the received standard sufficiently to require the compilation of a new table, which is here presented.

The ratio of the pressure as compared with the temperature of steam. will be found to increase considerably more than the tables now in use assign, and the correctness of this position is confirmed by the experiments of Magnus. On the other hand, the dilatation is reduced by the experiments of M. Regnault. And this, together with the weight of a litre of dry air, is all the additional data which we have on which to base the new calculations. We have, therefore, nothing but the old and well-known formula, $\left(\frac{p}{t+x}\right)$ to go by. By this the tables at present in use have been calculated, and the value of x, as obtained from the experiments of M. Gay Lussac, is 480° F., hence, $\left(\frac{p}{t+480};\right)$ 480 being the number of degrees above 32° F., to which dry air is required to be heated to double its volume.

The same formula becomes $\frac{p}{t+272\cdot47905}$ by retaining the original basis (the centigrade) of calculation. The new table extends to the limit of M. Regnault's at the end of his ninth Memoir, and embraces each decade of the centigrade from 0° to 230°.

In addition to the temperature by the centigrade, the pressure in atmospheres, and the total heat above 0° C., I have shown the cor-

* Memoirs of the French Institute, Vol. xxi, 1845.

1 *

responding temperature, and the total heat by the Fahrenheit scale, the pressure in lbs. per square inch, and in inches of mercury.

I have also calculated by the formula before mentioned, the expansion of a volume of water at 62° F.,* by vaporization under the different pressures; also the number of cubic feet of steam required to weigh one pound.

But the most important addition, I consider to be the 8th column, which represents the duty of one pound of water just as the duty of one bushel of coal is represented by the returns of the Cornish engineers.

The "conclusion" which M. Regnault arrived at from his experiments on the dilatation of the elastic fluids, is, that, when the co-efficient of dilatation is derived from their expansion between 0° to 100°, while the elastic force remains constant, it is 0·3670, or 1 in 272·47905† for each degree above 0° C., corresponding with 1 in 490·463 for each degree above 32° F.

The same authority informs us that a litre of dry air under the ordinary pressure of the atmosphere, and at 0° C., (32° F.,) weighs 1·293187‡ grammes, which gives ·08063563 lbs. per cubic foot. Therefore, by calculating the decreased density of air by the law of Bogle and Marriatte, we have ·0589873 lbs. as the weight of one cubic foot of air at 100° C., under the ordinary pressure of the atmosphere.

There are no reliable experiments that I know of, which give the absolute weight of steam, for although M. Regnault promised to investigate the subject, I believe that he has not yet done so; and therefore we have to resort to M. Gay Lussac's ratio of ·62349, air being 1, and both at 100° C., (212° F.,) at which temperature one cubic foot of steam weighs ·036778 lbs.

Finally, taking the weight of 1 cubic foot of water at 62° F., at 62·321 lbs., we have 1694·48 cubic feet of steam at 212° F., produced therefrom.

And 100 cubic inches of steam at 212° will weigh 14·89849§ grains, while at 32° it will weigh ·123269 grains instead of, as formerly assumed, 14·96 and ·13716 grains respectively.

If this table is favorably received, I hope at some future time to extend it to every degree of the centigrade, and I cannot forbear expressing the hope that ere long no other thermometer will be in use.

If engineers, instead of taking the square inch, will take 2·31162‖ square inches for the base on which the pressure of steam is measured, call it the "*Standard Base*," and say so many pounds pressure per "Standard," *i. e.*, a base of water which at 62° F. weighs one pound for one foot in height, it will very much simplify calculations, and tend to give a clearer conception of some of the most important properties of steam.

* In case the new system of condensation becomes universal, and of which the writer has not the slightest doubt, the temperature of the water should be taken at 212° F., as it will always enter the boiler at about that temperature or rather above it. In this case, one cubic foot of water will weigh exactly sixty pounds, and the "standard base" will be 2·4 square inches, $(=144'' \div 60.)$

† The experiments of M. Gay Lussac which have heretofore been accepted and relied upon, give ·365, or 1 in 266·666 for each degree above 0° C., corresponding with 1 in 480 for each degree above 32° F.

‡ M. M. Boit and Arago calculated this at 1·299541 grammes.

§ Troy grains, of which there are 7000 to the pound avoirdupois.

‖ But see a previous note, wherein 2·4 square inches is proposed.

TABLE

Of the Temperature, Elastic Force, Weight, Volume, Mechanical Power, and Total Heat of Steam for every decade of the Thermometer from 0° to 230° Centigrade.

Temperature. Deg. Centigrade.	Temperature. Deg. Fahrenheit.	One pound of steam in: Elastic force lbs. per Square inch.	Elastic force lbs. per Standard Base.	Elastic force in Inches of merc.	Elastic force in Atmospheres.	One pound of steam in Cubic feet.	One volume of water at 62° F., converted into steam occupies in Volumes.	One pound of water at 62° F., resists conversion into steam with a force equal to lifting it in height. Feet standard power.	It is the absolute mechanical power forced into the water during its conversion into steam. Total heat above. Fahrenheit 32°.	Total heat above. Centigrade 0°.
0	32	·089	·20542	·1811	·006	3286·	204802·	42071	1091·70	606·5
10	50	·177	·40906	·3606	·012	1711·	106622·	43615	1097·10	609·5
20	68	·336	·77659	·6847	·023	933·	58150·	45160	1102·68	612·6
30	86	·610	1·4089	1·2421	·042	532·	33148·	46703	1108·26	615·7
40	104	1·061	2·4521	2·1618	·072	316·	19676·	48247	1113·66	618·7
50	122	1·778	4·1076	3·6213	·121	195·	12122·	49792	1119·06	621·7
60	140	2·876	6·6446	5·8580	·196	124·	7726·	51336	1124·64	624·8
70	158	4·505	10·409	9·1769	·306	82·	5080·	52880	1130·04	627·8
80	176	6·854	15·837	13·962	·466	55·	3436·	54424	1135·62	630·9
90	194	10·155	23·465	20 687	·691	38·	2385·	55968	1141·02	633·9
100	212	14·689	33·940	29·922	1·000	27·19	1694·48	57510	1146·60	637·0
110	230	20·784	48·023	42·338	1·415	19·73	1229·72	59056	1152·00	640·0
120	248	28·822	66·597	58·713	1·962	14·60	909·95	60600	1157·58	643·1
130	266	39·239	90·667	79·934	2·671	11·00	685·40	62144	1162·98	646·1
140	284	52·530	121·363	106·995	3·576	8·420	524·77	63688	1168·56	649·2
150	302	69·215	159·929	140·996	4·712	6·545	407·88	65232	1173·96	652 2
160	320	89·902	207·730	183·138	6·120	5·158	321·45	66776	1179·51	655·3
170	338	115·222	266·233	234·715	7·844	4·1176	256·62	68320	1184·94	658·3
180	356	145·850	337·003	297·107	9·920	3·3266	207·31	69864	1190·52	661·4
190	374	182·500	421·688	371·766	12·425	2·71713	169·35	71408	1195·92	664·4
200	392	225·914	522·001	460·204	15·380	2·24219	139·751	72952	1201·50	667·5
210	410	276·857	639·711	563·978	18·484	1·86859	116·452	74496	1206·90	670·5
220	428	336·106	776 612	684·672	22·882	1·57110	97·9121	76040	1212·48	673·6
230	446	404·447	934·523	823·887	27·535	1·33213	83·0198	77584	1217·88	676·6
0	1	2	3	4	5	6	7	8	9	10

NOTE.—Columns 3, 6, and 8, are new features in the table; the first (3) representing the pressure in pounds upon a base coincident with that of a column of water one foot high, which will weigh one pound. This base it is proposed to call the "*Standard Base*," to be used instead of the "*square inch*" now used for that purpose. Multiplying the pounds of pressure per "Standard Base," by the volumes into which the heat will expand the water in converting it into steam; (7) gives the next column, (8) representing the whole mechanical power of

the steam or the "*Standard Power*," which may be converted into horse power by being divided by 33,000.* Column 6 gives the number of cubic feet of steam which will weigh one pound. Columns 0, 5, and 10, are identical with M. Regnault's table at the end of his ninth Memoir, before referred to.

In applying this table to calculating the power of a steam engine working "differentially," according to the "*new method of applying and condensing steam*," I shall premise that any good oscillating engine will give out 82·5 ℔ cent. of the power of the unbalanced steam.

In the "Memoir," vol. xxxi, p. 343, of this *Journal*, I have mentioned a back pressure in the "differential" method of applying the power of steam, as if it formed a necessary part of the system, that such back pressure should greatly exceed that of the atmosphere, which is not the fact, indeed it is just the reverse; when steam from a high pressure steam engine exhausts into the atmosphere, the back pressure on the piston must necessarily be greater than is due to the mere steam itself, because it is constantly surging to and fro at every stroke with the whole weight of the atmosphere, whereas, in my method, the back pressure is that of the steam in the condenser *only*, which is always leaving the piston, and the quantity of the condensing water being properly regulated, the pressure in the condenser may be kept at the pressure of the atmosphere to the greatest nicety, and thus prevent any of that surging *into* the exhaust pipe by the atmospheric air, and the *bellowing* of the steam to get it out again.

The one is a mere statical pressure, while the other is a dynamic force of the very worst kind for the steady working of the engine.

In comparing the new or "differential" method of applying and condensing steam, with the ordinary high pressure mode of exhausting into the atmosphere, (irrespective of the recuperative power of the former method,) we have to consider the amount of the back pressure of the latter over and above that of the atmosphere, to which (viz: the pressure of the atmosphere,) the differential method may be confined with a certain economy, to the extent of that difference, whatever it may be.

If this simple but incontrovertible fact is established, viz: that the "differential" method gets rid of the surging back pressure of the atmosphere as a dynamic force, and converts that pressure into a mere static one equal to that of the atmosphere only, then the consequences are inevitable, for, say that there is no loss merely, and is it not clear that the economy of bringing into operation the recuperative power of the "differential" method must inevitably cause its adoption? Firstly, because any increase of back pressure† which may be required, causes the feed-water to become so much hotter, as to fully compensate therefor, and the boiler is supplied with hot distilled water at no cost what-

*In calculating the effective power at 75 ℔ cent of the total power in the unbalanced steam, this divisor becomes 44,000 (=33, 00 ÷ ·75); at 82·5 ℔ cent., it is 40,000 (=33,000 ÷ ·825.)

†The back pressure is only necessary when distilled water is required, to obtain which, by any other means, involves the necessity of another boiler, to all intents and purposes as objectionable as those which it is the object of the surface condenser to remove, only, instead of having four boiler to blow off, but one is required, and hence, to that extent, there is a saving of engineer, but none of fuel, and none of boiler either, where copper tubes are used for the condenser while the boiler is of iron. See the February number of this Journal, vol. xxv. page 94.

ever, by means of which, its evaporative power and durability* are increased to an enormous extent. This consideration alone should settle the matter, for the known inefficiency of the air pump surface condensing steam engine, makes it entirely unnecessary to establish any comparison with it, but we may do so by way of making an example of the culprit.

Rule 1, for the "differential" method.

To ascertain the weight of steam required per minute for a steam engine of a given power, multiply the "*Standard Power*," (*i. e.*, the whole power in one pound of working steam in the cylinder,) by the pounds per "*Standard Base*" of unbalanced steam pressure, and divide the product by the pounds per "*Standard Base*" of working steam, and with it as a divisor, divide 40,000 times the horse power (H. P.,) required, and the product is the number of pounds of water per minute which must be converted into steam to furnish it.

To find the cubical contents of the cylinder in feet.

Rule 2. Multiply the number of pounds of steam as found by Rule 1, by the cubic feet in one pound of it by the table, and divide by the number of single strokes of the engine per minute, and the product is the capacity of the cylinder in cubic feet.

Example I.—Required an engine of 3 H. P. to be worked with full steam of 160 lbs. per "Standard Base" of pressure of the working side, and 34 lbs. on the exhaust side of the piston = 126 lbs. of unbalanced steam, and making 400 single strokes per minute. Here we have 65,232 as the "Standard Power," corresponding with 160 lbs. per "Standard Base" of working steam, and 126 lbs. of unbalanced steam pressure.

Now, by Rule 1, $(65{,}232 \times 136) \div 160 = 51{,}370 \cdot 2$, which represents the power of the unbalanced steam with one pound of working steam in pounds raised one foot.

Also, $(40{,}000 \times 3) = 120{,}000$. And, $(120{,}000 \div 51{,}370) = 2 \cdot 336$ lbs. of water required to be converted into steam to supply 3 H. P. for one minute.

Again, by Rule 2, $(2 \cdot 336 \times 6 \cdot 545) \div 400 = \cdot 382228$ cubic feet, or 66·05 cubic inches in the cylinder.

Therefore, if the length of the stroke be taken at 6″, the area of the piston must be 11 ins. or 3·6 ins. diameter.

We may calculate, that 50 lbs. of feed water, pumped into the boiler of a steam engine at the full boiling point, may be evaporated from 10 feet of recipient heating surface in one hour, by 5 lbs. of coal burned on $\frac{1}{8}$-th of a square foot of grate surface, and shall constitute one H. P., the unbalanced steam being equal to lifting 40,000 lbs., one foot high per minute. The steam shall be well dried and worked at full pressure throughout the stroke. The condensing water must be 200 lbs. or (4 times the weight of the feed water) of which 20 lbs.

* The durability of iron boilers is affected in a most extraordinary manner by cold water. Hot pure water appears to have but little or no effect upon it, except dissolving a little of the oxide, while cold water gives it the rheumatism, gets inside of it, and causes large flakes to peel off, whole lamina in fact. I have reason to believe that these remarks apply to some extent to sea water also, as they are well-known to apply to ordinary boiler water.

or ·10 of the whole, or 4 times the weight of the fuel consumed, shall be evaporated from the hot-well for the following purposes, viz:—

	lbs.	
Condensed,	2	to make up for the waste from the boiler.
	3	for any purpose that it may be required for.
Uncondensed,	15	to improve the draft of the chimney.
	20	

Here we have 50 lbs. of steam to condense, and 200 lbs. of water to do it with, but of the 50 lbs. of steam, 2 lbs. are allowed for waste, and 15 lbs. more is transferred to the 200 lbs. of condensing water, and goes off by the blast pipe in the shape of vapor, leaving but 33 lbs., $(=50-(2+15)$ of steam to be condensed by 185 lbs., $=(200-15)$ of water, for the 15 lbs. is equally lost, both as to the latent heat of the steam, and as condensing water. The 3 lbs. of vapor which is taken from the hot-well, and is to be condensed by the same stream of water which it is taken from, is practically the same as taking so much of the hot water itself.

And so we have 5·606 lbs. $=(185 \div 33)$ of the condensing water to condense 1 lb. of steam, and as the waste hot water which carries off the surplus heat runs away at 100° C., and the working steam at 150° C., has a total heat of 652·2°, we have, 552·2° $(=652{\cdot}2-100)$ to run to waste, and $552{\cdot}2 \div 5{\cdot}606 = 98{\cdot}5°$ gives the increase of temperature of the condensing water, which must therefore enter at 1·5° C., $(=100-98{\cdot}5)$ to effect the condensation if no allowance is made for radiation.

Now, let us analyze the whole of these productions and ascertain what we have got of available property in them, premising 1st. That we obtain one H. P. from the combustion of 5 lbs. of coal per hour, the engine working without expansion.

That is all we bargained for and the rest is surplusage—therefore:

2d. An abundance of distilled water to make up for the waste from the boiler, the importance of which is not fully appreciated, or no mere subterfuge would be tolerated for one moment, and that is a mere subterfuge which does not effect its whole object.

3d. Distilled water for the use of a ship, &c.

(Note.—Altogether 5 lbs. or $\frac{5}{8}$-th gallon per hour for each H. P., is available for the above two purposes in ordinary cases.)

4th. 15 lbs. of vapor to improve the draft of the chimney, but if that is not needed, then it may be applied to the working of another steam engine, of the air pump condensing kind, and will give out 1·875 H. P.

(Note.—Taking the whole 20 lbs. of uncondensed vapor, the power obtainable from it is ·25 H. P., so that in point of fact, we can obtain 1 H. P. from the combustion of 4 lbs. of coal per hour, the engine working without expansion. Taking this statement as including all the advantages obtainable from the steam, there is still something left in.)

5th. $22\frac{1}{2}$ gallons per hour per H. P. of boiling hot water.

As to the areas of the condensing surfaces, my experience thus far assigns to the

Main condenser,	.	3·00 feet supl.
Heater "	.	0·75 "
Condensing surface,	.	3·75 feet per H. P.
Distilling condenser,		0·75
Condensing and distilling surfaces,		4·50 "

Finally. If the working steam is 100 lbs. per square inch of pressure above the atmosphere, and the back pressure is 6 lbs. above it, we shall have 1 H. P. from 43 lbs. of feed water evaporated by 4·3 lbs. of coal, or with an auxiliary air pump condensing engine to use up the whole of the low pressure steam, we shall obtain one horse power from the combustion of 3·44 lbs. of coal, and cutting off the steam at one-fourth of the length of its stroke will give one horse power from the combustion of 1·5 lbs., according to the usual mode of calculation, which, however, involves a great fallacy, for in this case, the advantage of cutting off at one-fourth of the length of the stroke will scarcely effect a saving of more than one-third of the fuel, and therefore 2·3 lbs. per hour per horse power is as low as can be calculated upon. The fallacious results usually arrived at in such calculations, arises from neglecting the space necessary for the clearance of the piston, as well as the steam in the passages, which even with such moderate expansion as allowed above is nearly half as much as the steam admitted.

I risk nothing in asserting that without expansion, the air-pump surface condensing engine will require upon the average not less than 90 lbs. of feed water per hour per horse power, and that, owing to the low temperature at which it must necessarily be pumped in, together with the ordinary scale upon the boilers, from having one-fourth of sea water in them, and the blowing off continually necessary, not more than 7·5 lbs. of such water can be evaporated with 1 lb. of coal, which shows that 12 lbs. of coal per hour is necessary on such a system, while 5 lbs. is sufficient on the new one.

The investigation which I have courted, will doubtless prove very tedious to any one who will take it up, but surely its importance should command some attention, if not as a mere theory even, at least as a successful result of several years' practical experience, both with salt and fresh water as the condensing medium.

In my next, I hope to be permitted, by the aid of a pictorial illustration, to show the modus operandi which I have adopted in carrying out the system, and also what becomes of the total heat in the exhaust steam, in such a manner as to defy all cavil, and assure the *unbelievers* that not only can steam be condensed with boiling hot water, but also that *more* distilled water "can be returned into the boiler than it evaporates." And, furthermore, that both are done daily, and the method by which it is done is simple in the extreme, and open to the inspection of all.

For the Journal of the Franklin Institute.

The High Pressure Jonval Turbine.

To the Committee on Publications.

Gentlemen:—I take the liberty of laying before the Committee, some facts relating to a High Pressure Jonval Turbine, planned by Mr. Emile Geyelin, of your city; which, owing to the great fall under which the turbine operates, will no doubt be interesting to the scientific readers of your *Journal.*

In the latter part of the year 1853, a company was formed near Saltillo, Mexico, for the purpose of building and putting into operation a cotton mill of 10,000 spindles, proposing to manufacture coarse cotton goods for the home market.

The water power which is used for driving the mill was recommended by my brother, Mr. James Prince, who was employed as the engineer. It is 160 feet between the upper and lower levels of water, and the stream is capable of furnishing 600 cubic feet of water per minute.

After selecting this site, it was at first proposed to use as a motor an iron over-shot water wheel of 100 feet diameter, thus losing over one-third of the total fall. But, in consideration of the great cost of such a motor, and the cost of its transportation by land from the Rio Grande to Saltillo, the company deemed it advisable to secure, if possible, some other system of hydraulic machinery.

About this time an estimate was received from Mr. Emile Geyelin, who proposed applying as a motor a double Jonval Turbine, using the whole 160 feet fall, and the full capacity of the stream, (600 cubic feet of water per minute.) The price asked by Mr. Geyelin for the machine was $3300. The small cost—the ease with which the parts could be carried over land, and the opinion of the engineer of its adaptability to the locality, determined the company to accept Mr. Geyelin's proposal.

It has now been in constant use as a motor for over three years, and has, I am happy to say, surpassed our most sanguine expectations. Its full capacity is 126 horse power, all of which power is, however, not yet required by the machinery in the mill.

The following description of its dimensions and manner of construction, I have obtained from Mr. Geyelin:—

High pressure double Jonval Turbine with horizontal shaft, built for a cotton factory, near Saltillo, Mexico, during the summer of 1854. Fall, 160 feet; quantity of water, 600 cubic feet per minute. In order to suit the arrangement of the mill buildings, the turbines are placed 18 feet above the lower level of water, and the water which passes through the wheels, is carried from them to the lower level, through air-tight pipes. An iron conduit pipe, 450 feet long, and 20 inches diameter, serves to lead the water to the wheels. There are two wheels used, which are placed on a horizontal shaft, in order that they may balance each other, thus preventing the enormous thrust on the step, or suspension arrangement, which would have been the case if only one wheel had been used. The shaft is of steel, $2\frac{1}{2}$ inches diameter. The outer ends of the guides, and of the buckets of the turbines, have wrought iron bands shrunk around them, both guide wheels, and tur-

bines proper, being encased in cast iron chambers. Each moving wheel or turbine proper has 15 buckets of polished steel, 2 inches high, and 1½ inches radial length. The total area of orifices of discharge in each wheel, being 13 square inches. The external diameter of the moving wheels is 11 inches. The velocity of the wheels is 1860 revolutions per minute. Capacity of the motor 126 horse power.

Gearing.—Wrought iron pinion on the turbine shaft, 7 inches diameter at the pitch line; 1½ inches pitch; 9 inches face; which runs at a speed of 1860 revolutions per minute. This pinion gears into a mortise wheel on the counter shaft, of 56 inches diameter at the pitch line; 1½ inches pitch and 9 inches face; the cogs are of hickory wood, soaked in warm linseed oil; this wheel runs at a speed of 232 revolutions per minute. The power is transmitted to the line shaft in the mill by a belt 24 inches wide, running over a pulley on the counter-shaft, of 3 feet diameter.

The pedestals which support the turbine and counter shafts, and also the iron chambers in which the turbines revolve, are all fastened to a strong iron bed-plate, 15 feet long and 4 feet wide.

Hoping the above may prove interesting, and find a place in your *Journal*, I remain, very truly yours,

STEWART PRINCE.

Paterson, New Jersey, April 16, 1858.

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*Consumption of Coals and Rate of Evaporation from Engine Boilers.**

Mr. Graham read a Paper at the Manchester Philosophical Society, in which he described the results of experiments which he had made with a series of small vessels of equal size, the fire being under the first, and the flame bed alone passing under the others. The evaporative power of the first was found to be equal to 100, the second to 27, the third to 13, and the fourth to 8. A second set of experiments with larger vessels, in the shape of boilers, corroborate these results. The third series of experiments were made with the view of determining the value of a supplementary boiler as heating surface, placed under the most favorable circumstances; the result showed an advantage of 15 ℔ cent.

Mr. Graham then detailed the results of a numerous set of experiments on evaporation, on the large scale, with reference to engine boilers. These experiments have extended over a period of several years, observations being made daily, and the results deduced from several hundred recorded observations.

Before beginning to register his results, the boilers were in each case re-set, and, by careful and continuous experiments, were put into what was found to be their best condition for giving the best working result, as regards the admission of air, the draft of the chimney, the size of the fire-place, the distance of the bars from the boiler, the thickness of the fire-bars, and of the fire itself, the form of the

*From the London Mining Journal, No. 1177.

flame bed, flues, and bridges. Mr. Graham stated that in the case of one boiler, the alterations had been repeated at least 30 times for this purpose. The experiments with the boilers were of 12 hours duration each, and number from 30 to 40 for each boiler. A perfect command was maintained of the draft, which varied from 0·5 to 0·7 in. pressure of water, and the temperature of the draft at the bottom of the chimney was generally sufficient to melt lead (612° F.), but never zinc (773° F). The conclusions which Mr. Graham arrived at by means of these experiments were the following:—

1. That the boiler usually called the "Butterley, or Fishmouth boiler," 25 feet long and 7 feet diameter, will, under favorable, but what may be called ordinary circumstances, give with the Worsley coal, for each pound of coal burnt, 8·29 lbs. of steam; or, not including the heating of the feed water from 60° to 212° F., 9·67 lbs.

2. The boiler usually known as James Watt's "wagon-shaped boiler," 25 ft. 6 ins. long, and 6 ft. 6 ins. diameter, will, under similar circumstances, give 8·80 lbs. of steam; or, not including the heating of the feed-water from 60° F. to 212° F., 10·26 lbs. of steam for each pound of coal burnt.

3. The plain cylindrical boiler, with fire-place underneath, 42 feet long and 6 feet diameter, will, under similar circumstances, give 6·20 lbs. of steam; or, not including the heating of the feed-water from 60° F. to 212° F., 7·23 lbs. of steam for each pound of coal burnt.

4. The boiler with two internal fire-places joined into one internal flue, known in the neighborhood of Manchester as the "breeches boiler," 23 ft. long and 8 ft. diameter, will, under similar circumstances, give 5·90 lbs. of steam; or, not including the heating of the feed-water from 60° F. to 212° F., 6·88 lbs. of steam for each pound of coal burnt.

5. That a supplementary boiler, under very favorable circumstances, gives a saving of 15 ℔ cent.

6. That flues round a boiler, when cleaned out, and the sides of the boiler scraped once a week, will give a saving of about 2 ℔ cent.

7. That a difference in the setting alone of the same boiler may produce a difference in the result amounting to 21 ℔ cent.

8. That the difference between a good shaped boiler, properly set, and a bad shaped boiler, improperly set, but both clean and in good order, may amount to as much as 42 ℔ cent.

9. That a difference in firing only will produce a difference in the result of 13 ℔ cent.

10. That the smallest loss by smoke burning, or by the admission of cold air, either over the furnace door or in front of the bridge, or at the back of the bridge, has been 1·7 ℔ cent.

11. That the loss arising from a scale of sulphate of lime, of not more than one-sixteenth of an inch, amounted to 14·7 ℔ cent.

12. That neither wet coal, nor coal which had been out of the pit three years, nor wet weather, nor a variation of temperature in the atmosphere from 40° F. to 70° F., produced any appreciable difference of result.

13. That windy weather invariably gave a good result.

14. That a comparatively thick and hot fire, with a good draft, uniformly gave the best results.

15. That the difference in the results obtained with different coals, all from the immediate neighborhood, amounted to a loss of 11 ℔ ct.

16. That the same coals, reported to be from the same pits, will vary in their results to the extent of 6 ℔ cent.

17. That when a boiler is worked solely for the purpose of heating, by means of its steam, dye vessels, soap cisterns, &c., if its available power, with the steam at a pressure of $2\frac{1}{2}$ lbs., be taken as equal to 100, then at 7 lbs. pressure its available power will be 120, and at 10 lbs. pressure it will be 130; the same quantity of coal being consumed in each case. This surprising result, at present unaccounted for, may be thus stated:—That the same weight of coal consumed in the same number of hours will work ten cisterns at $2\frac{1}{2}$ lbs. pressure, twelve cisterns at 7 lbs. pressure, and thirteen cisterns at 10 lbs. pressure.

18. That while we may reasonably look for improvements in the construction of the fire-place, in the form of boiler, in the addition of separate supplementary heating surface, and in cleanliness, and may thereby effect a great saving in the consumption of coal, we cannot, at the same time, expect much saving from extension of flue space, when coated with soot, or for greater length of boiler than four times the length of the fire-place.

Mr. Graham stated in addition, that in consequence of the uniform low results obtained by evaporation from boilers and flues open to the atmosphere, which, according to his experience, never rise higher than from 5·5 to 6·0 lbs. of steam for each pound of coal burnt, also from the increased results obtained with increase of pressure, and apparently due to that condition, he is disposed to suggest that the rate of evaporation of water per pound of coal increases with, and bears some ratio to, increase of pressure.

With regard to the deposition of sulphate and carbonate of lime and mud in boilers, Mr. Graham stated that he had experimented, with more or less success, with caustic soda, quick-lime, muriatic acid, soap liquor, sawdust, spent madder, and logwood chips. Two facts in particular were noticed as regards the tendency of hard water to "scale"—1. That the sulphate of lime separates from the water when in contact with the bottom of the boiler, or with other substances, such as sawdust or other materials floating in the water; but that no precipitation takes place until the water has been concentrated, by continued evaporation, down to the state of a saturated solution, or to that point which may be termed the "salting point."—2. That *carbonate of lime* and mud are principally liberated in the body of the water, and have but little disposition to adhere to the boiler, unless cemented by the sulphate of lime.

Practically, therefore, it has been found that no scale of any consequence will be produced on engine boilers, even with such hard water and hard firing as Mr. Graham has been accustomed to, if 100 gallons of the concentrated liquor of the boiler, equal to 4 ℔ cent. of the

amount of feed water used daily, and 300 gallons, or 12 ℔ cent., be run away on Saturday through the usual mud machine, and if the boiler be run empty every sixth Saturday and brushed out. The water used was so hard as to require from 35 to 40 measures of Clark's test liquid to soften it. There is little loss incurred by this mode of working, since the chief discharge may take place at the close of each day's work; and there is an incredible advantage gained by the saving of coal, the reduced wear and tear of the boiler, and the greater safety of all persons concerned with it.

Railway Accidents in Great Britain during the Year 1857.*

The Board of Trade Report by Captain Galton, on railway accidents for the year 1857, has just been issued, and from it we learn that in the year 25 passengers were killed, and 631 injured, "from causes beyond their own control."

These are all the real railway accidents in the year. There were others, such as from suicide, trespassing, &c., but they cannot properly be placed against the account of railways.

The 25 fatal railway accidents in 1857, occurred mostly on English railways. Of the 25, as many as 24 occurred in England, and of these 24, exactly half, 12, were killed in one accident, namely, the Lewisham accident on the South Eastern railway. One passenger was killed on Scotch railways. "In Ireland, (reports Captain Galton,) there were no passengers killed or injured from causes beyond their own control." On most of our railways in England no fatal accidents have occurred.

The following is Captain Galton's account of the 25 fatal accidents, specifying the railways on which they occurred:—

In England,—

"One passenger was killed at the London bridge station of the London, Brighton, and South Coast railway, in consequence of a passenger train leaving the rails at some facing points.

"Twelve passengers were killed at the Lewisham station of the South Eastern railway, in consequence of a collision between two passenger trains.

"Five passengers were killed on the Great Northern railway, near Tuxford, in consequence of the train leaving the rails.

"A female passenger who had got upon the step of a carriage in a train which was thrown off the rails near the Collingham station, on the Lincoln Branch of the Midland railway, either fell or jumped off, and was killed.

"One passenger was killed near Hull on the North Eastern railway, in consequence of a collision between a passenger train and a goods train.

"Three passengers were killed on Morgans Moor, near Pyle, on the South Wales railway, in consequence of a collision between two passenger trains proceeding from opposite directions.

"One passenger was killed on the South Devon railway, by his head coming in contact with a bridge."

In Scotland,—

"One passenger was killed near Lossiemouth on the Morashire railway, by falling from a truck which had been imperfectly fitted up to convey excursionists, and the railing of which gave way."

*From Herapath's Journal, No. 982.

Thus, three accidents on three railways supply almost all (20) of the 25 unhappy occurrences—

12 South Eastern railway, Lewisham accident.
5 Great Northern Tuxford accident.
3 South Wales, Pyle accident.
—
20

The South Eastern have had to pay a pretty penny for the Lewisham accident, for Captain Galton informs us that "the compensation alone in the case of the Lewisham accident on the South Eastern railway amounted to £25,000." £25,000 in compensation for one accident!

The figures following will show how infinitesimally small is the number of fatal accidents to passengers in relation to the number of passengers carried:—

Year.	No. of miles of railway open.	No. of passengers conveyed.	No. of passengers killed.	Proportion of killed to carried.
1850	6326	72,854,422	12	1 in 6,071,202
1851	6755	85,391,095	19	1 in 4,494,268
1852	7113	89,135,729	10	1 in 8,913,572
1853	7488	102,286,660	36	1 in 2,841,296
1854	7812	114,358,888	12	1 in 9,529,907
1855	8175	118,595,134	10	1 in 11,859,513
1856	8499	129,347,592	8	1 in 16,168,449
1857	8900	returns not complete.	25	cannot be calculated.

The proportion of passengers killed to passengers carried will probably be found to be, when the calculation can be made, about one in 5,200,000 in last year; one passenger killed for every 5,200,000 carried.

Bad, therefore, as 1857 has been for accidents, it is better than 1851 and 1853. We have seen how it is that the number killed is so high as 25 persons. We might say that one casualty causes the excess.

Nearly all the accidents occurred "from accidents which happened to trains."

The suggestion of Captain Galton contained in the paragraphs we now quote, is worthy of consideration—

"Having regard to all the circumstances of this intricate question, it appears that the only practicable mode of obtaining a diminution of railway accidents would be to endeavor, by means of a more satisfactory investigation into the causes of the accidents, to obtain a more sure and just action of the law by which compensation is awarded. This would, probably, be best effected by causing a public inquiry to be made into the circumstances connected with every accident attended with injury to passengers or loss of life, and by an immediate publication of the report, showing the causes of accident. The necessary tribunal might be constituted in a similar manner to those which inquire into accidents to ships under the Merchant's Shipping Act, viz: by two justices or a stipendiary magistrate, and an inspecting officer of this department as assessor.

"The clear knowledge of the cause of accidents would save much useless litigation by claimants for compensation; and the shareholders and the public would obtain an impartial account of the circumstances which led to the accidents, immediately after their occurrence, which would tend materially to diminish mismanagement."

Remarks by the Editor of Herapath's Journal on Ellwood Morris' Fish Splice for Railway Joints.—April 10th, 1858, No. 983.

We offer no objection to this modification of the usual mode of fish jointing; but it appears to us, if it be found in practice to have any advantage, it will lie chiefly in the length of the chair; and any defect will probably be found to lie in the possible want of a close fit of the foot of the rail to the bottom of the chair, through, in part, the thrusting upwards of the rails by the method of keying the chair to them.

On a new Water Connexion between Locomotive Engines and Tenders. By Mr. JAMES FENTON.

Since the first introduction of the locomotive engine, now more than a quarter of a century ago, several plans have been adopted for connecting the feed-pipes of the engine and tender, capable of resisting for a time, without leakage, the great wear that takes place in the ordinary course of running, which is accelerated by blowing steam from the boiler of the engine into the tender tank. All these plans however have been expensive either in first cost, or to keep in repair, or both. Those most generally in use are the ball and socket pipes, and the flexible tubes or hose-pipes. Other and more recent inventions have been tried, but the author believes they have not been attended with an amount of success sufficient to ensure their general adoption.

With the view of meeting an acknowledged want, the author's attention was directed to the subject, and the water connexion described in the present paper is the result.

Two cylinders of brass or iron, bored out smooth and parallel, are bolted in the usual manner, the one to the feed-pipe of the engine, and the other to that of the tender. These cylinders are connected together by a tube of brass or iron, having the ends turned, and fitted with two collars, between which elastic rings of vulcanized india-rubber are placed. These rings, when at work, roll between the cylinders and the connecting tube. Light chains passing from the cylinders to the connecting tube, are used for keeping the tube in its proper position; they are each left slack to an extent of one-half the greatest amount of travel required between the engine and tender.

The advantages which this arrangement appears to possess are its extreme simplicity, and consequent cheapness, both in first cost and current repair, and the great durability of the only wearing parts; the motion of the elastic rings, when at work, being a rolling instead of a rubbing action.

The india rubber rings are made slightly larger than the space into which they fit, for the purpose of ensuring a thoroughly water-tight joint. The cylinders are $3\frac{1}{16}$ inches inside diameter, and the tube 2 inches outside diameter: the ring is made $3\frac{1}{8}$ inches outside diameter, and $1\frac{7}{8}$ inches inside diameter,—the section of the ring being a circle $\frac{5}{8}$-inch diameter.

Should either of the tender valves get out of order on the journey, and it becomes necessary to stop the feed by other means, it is only requisite to slack back the bolts of the coupling flanches, and introduce a piece of sheet iron or zinc between them, of sufficient width to cover the orifice of the feed pipe. This simple and effectual mode of stopping the feed was suggested and adopted by Mr. Ramsbottom, of the London and North Western Railway, on which, as well as on several other lines of railway, this water connexion has been in successful operation for several months.

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Mr. Fenton showed a specimen of the new coupling pipe, partly cut open, in order to show the action of the india rubber rings; also separate specimens of the rings.

Mr. Ramsbottom said he had had one of these coupling pipes in use rather more than two months on a locomotive, and it had worked so far very satisfactorily; the india rubber rings showed no signs of wearing out at present. He thought it decidedly a good plan, and likely to prove advantageous in use.

Mr. Craig had had one of them at work about three months, applied to a stationary force pump, working under 300 lbs. per inch pressure, and it had proved quite successful. He had now applied them to several locomotives, and was well satisfied with the results; he considered they would be much less expense to keep in order than either the hose pipes or the ball and socket couplings, and the economy of first cost was also in their favor.

Mr. W. B. Johnson had found india rubber valves last many years in steam engine air pumps, where they were exposed to a considerable temperature, sometimes 150°, but the material was subjected only to simple bending.

In answer to an inquiry of the Chairman, Mr. Fenton said, the cost of the coupling was £2 per set as compared with about £12 12*s*. for the brass ball and socket couplings,—being only about one-sixth in first cost; and there was also a considerable saving in the cost of maintenance. The rolling action to which the packing rings were subjected did not appear to be injurious to their material, as they had already run upwards of 8000 miles without any sign of injury, although exposed to the heat of blowing steam into the tender in the ordinary manner.

Proc. Insti. Mech. Engineers, London.

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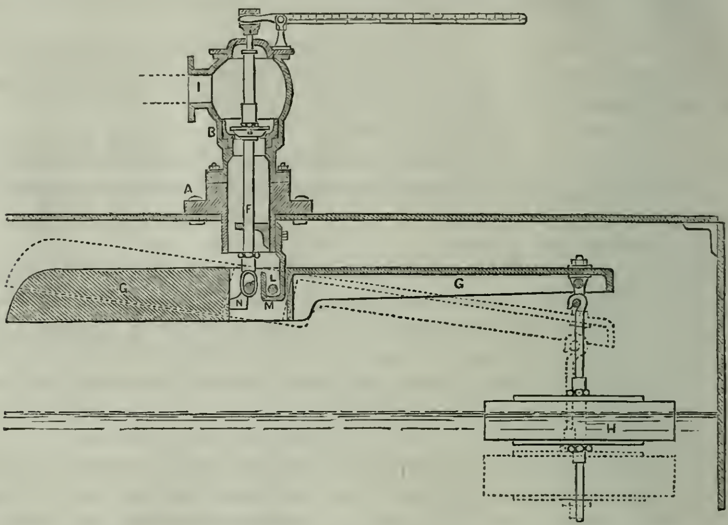
*Description of a Valve Guard against Excess of Steam Pressure and Deficiency of Water.** By James Clarkson Kay.

[Extracted from a Paper read at the Institution of Mechanical Engineers, Birmingham.]

A is a pipe fixed to the boiler, upon which the valve case B is placed. In the valve case B, is the valve seating C, constructed in the form of a cup, at the bottom of which the valve D is seated; the seating portion of the valve is of a spherical form, and above the valve and form-

* From the Lond. Civ. Eng. and Arch. Journ., April, 1858.

ing part of it, is placed a disk E, of larger diameter than the valve. The valve is placed on a spindle F, to which is attached a weight G, which loads the valve. The weight G may be made in any form convenient when acting simply for a steam pressure safety valve; but in this case, when the valve is intended to act also as a low water safety valve, the weight is made in the form of a lever, at the end of which is placed a stone float H, the combined weight of the lever, float, rods, &c., less by the weight of water displaced, being the load of the valve.



When the steam-pressure in the boiler acting on the underside of the valve D exceeds the load, the valve is raised; and the steam then acting on the enlarged area of the disk E, and being partially confined by the cup C, the valve continues to rise until a discharge of steam takes place through the pipe I, equal to the area of the pipe or valve seating.

In the case of low water in the boiler, the float sinks as the water lowers; and the increased weight at the end of the lever G brings the brass centre pin L to rest on the fulcrum or stirrup M, and raising the pin N, in the loop of the valve rod, unloads the valve, leaving it free to the action of the steam; the discharge of steam then takes place irrespective of the pressure of steam at the time or the size of the valve.

On an Improved Construction of Upright Steam Boilers.

By Mr. THOMAS DUNN.

The early forms of upright boilers, with chimney placed through the crown of the boiler, or in the side near the top, allowed a great portion of the heat to pass into the chimney flues. An attempt was made some years ago to retain this heat, by placing tubes of small diameter in the

crown of those boilers; this, however, rendered it liable for dirt and sediment to collect on the top of the tube plates next the fire, causing them to burn away, as also the ends of the tubes.

These objections led the writer to contrive a boiler which should retain the heat without the use of tubes, and should also cause a mixture of the gases for the purpose of burning the smoke.

This improved upright boiler has two furnaces, the heat and gases from each rising into the crown of the boiler, in which they meet and combine; the alternate working of the fires causing the flame from one fire to burn the smoke formed in the other, and *vice versâ;* the heated current then turns down through a central space, passing again through the water before entering into the chimney flue. Several of these boilers have been made and tested, and have worked very satisfactorily. One, which has been at work nine months at the writer's works, is of the following dimensions:—diameter of outer shell, 4 feet 6 inches; height from ground line to top of crown, 10 feet; diameter of inner fire-box, 3 feet 11 inches; width of down draft flue, 5 inches. The whole of the fire-box and boiler is of Staffordshire iron, the outer shell being $\frac{3}{8}$-inch thick, and the inner fire-box and flue $\frac{7}{16}$-inch thick. The heating surface measures 145 square feet, and the fire-grate is $7\frac{3}{4}$ sq. feet area. The flat water spaces, forming the down draft, are 3 inches wide, and stayed with screw stays 5 inches apart, similarly to a locomotive fire-box.

The following general results were obtained in a set of experiments made with this boiler, taking the mean of three days' working with each description of coal; the steam pressure being maintained at 65 lbs. per square inch throughout, and the temperature of the feed water at 62° F.:—5·90 lbs. of water were evaporated per lb. of coal, with best Lancashire coal, at 10*s*. per ton delivered, burning 16·48 lbs. per square foot of grate per hour; 4·38 lbs. of water were evaporated per lb. of coal with Burgy or the refuse of coal pits, at 5*s*. 6*d*. per ton delivered, burning 20·90 lbs. per square foot of grate per hour. The outer shell of the boiler was not clothed, which caused a considerable loss of heat by radiation in the experiments.

After trying several of these boilers, the writer constructed one with a circular down draft flue, for the purpose of saving the expense of stays: this plan did not give quite so much heating surface, but allowed rather more grate area; and the results of this boiler were found very similar to those of the former experiments. The fire in this boiler is not divided, but the gases are allowed to combine in the fire-box.

This plan of boiler is well adapted for the interior of buildings, where dust and dirt from ordinary boilers would be an annoyance, as the ash-pits are below the surface of the floor, and are made to hold the accumulation of a week's ashes. No external iron chimneys or pipes being required, there is also less risk of accident by fire. The expense is not more than that of the ordinary upright boilers. These boilers have been proved with water pressure to 150 lbs. per square inch.

AMERICAN PATENTS.

List of American Patents which issued from March 30 to April 27, 1858, (inclusive,) with Exemplifications.

MARCH 30.

268. Cultivators; Joseph Banks, Dadeville, Alabama.

Claim—The construction, arrangement, and combination of the body of the implement and its movable teeth, whereby it is readily adapted to properly receive, in turn, the several scrapers employed for performing the various modes of cultivation.

269. Sugar Mould Carriages; Charles E. Bertrand, Williamsburgh, New York.

Claim—The sugar mould carriage, constructed and arranged to operate as described—that is to say, the platform. in combination with stationary pins, supported by two wheels and a caster, the standard of which bears against, and pivots in the upper or brace plate, the latter being composed of semicircular arms, holding, in connexion with guard chains or bars, the conical moulds.

270. Regulator for Time Keepers; Dana Bickford, Westerly, Rhode Island.

Claim—Fitting the compensating curb to a curved groove, or its equivalent, furnished with a number of set screws which operate to secure the curb in its place, and to adjust or vary the effective length thereof, and thus constitute a means of correcting its compensation.

271. Machines for Hulling and Cleaning Clover Seed; I. V. Blackwell, Ovid, New York.

Claim—The application of the gravitating curtain at the point of the eduction of the blast, for the purpose of modifying and diffusing the same, and preventing the waste of seed. Also, the combination and arrangement of the overshot grating cylinder and feed roller, the blast generator, and blast regulating curtain.

272. Cigars; Thomas Blanchard, Boston, Massachusetts.

My invention consists in making the cigaretta with a hollow tube through its centre, the tube being formed out of the wrapper itself.

Claim—As a new article of manufacture the cigaretta or paper cigar.

273. Staples for Blind Slats; Byron Boardman, Norwich, Connecticut.

Claim—Constructing wire staples (such as are used for connecting the semi-revolving slats of window blinds and screens to a rod governing their positions,) by giving them a rounded edge, and an acute or sharp edge as viewed crosswise, in combination with transverse indentations across the wire, the whole being formed by compression between dies.

274. Paper Files; W. Z. W. Chapman, City of New York.

Claim—The combination and arrangement of two or more wires, or their equivalent, on a rod, or its equivalent. Also, the combination of the ring or rings, and lock plate, for securing the ends of the wires.

275. Harvesters; George E. Chenoweth, Baltimore, Maryland.

Claim—Compensating for the wear of the worm or groove in the driving cylinder by making the parts of that cylinder adjustable, thus giving increased certainty to the action of the cutters.

276. Lubricators for Railroad Axles; Wm. Clough, Madison, Indiana.

Claim—The combination of the oiling finger sleeve or hub, slotted arm, and wrist. Also, making the oiling finger sleeve and slotted arm, from the same piece of wire.

277. Opening and Closing Outside Blinds; John E. Clokey, Washington, D. C.

Claim—The combination of the bent levers with the bars.

278. Screw Cutting Machine; Richard H. Cole, St. Louis, Missouri.

Claim—Arranging a set of vibrating chasers in a revolving chuck, in such a manner that the said chasers may be opened and shut while the chuck is in motion, and of so constructing and adjusting the said chasers that they shall turn the bolt blank to a given size, and chase the thread on it in one and the same operation. Also, the combination of the two plates and the cam with the cross-head. Also, combining the turning lathe with the screw cutting machine, whereby the heads of the bolts are turned at the same time the chasers cut the thread on their points. Also, combining a universal chuck in the opposite end of the same shaft on which the chasing chuck is fixed, whereby the nut can be tapped at the same time the thread is cut on the bolt, and with the same power and motion.

279. Horse Hay Rakes; Asahel Cowley, Harpersfield, New York.

Claim—The combination of a separator with a wheel rake.

280. Manufacture of Soap; Dalrymple Crawford, Toronto, Canada.

Claim—Mixing with soap the refuse from indian corn after it has been subjected to the action of alkali in extracting the starch.

281. Folding Billiard Table; Charles Croley, Cincinnati, Ohio.

Claim—The arrangement of certain devices for folding and moving the frame of the table, and swinging the bed of the table, consisting of the pieces, hinges, the levers, leg pieces, and rollers, and the links and rollers.

282. Compositions for Tanning Leather; Clinton Daniels, Elk Horn, Wisconsin.

Claim—The combination and use of cream of tartar and bi-carbonate of soda with catechu in making a liquor, and using the same for tanning hides and skins.

283. Balance Steam Trap; Wm. M. Davis, Philadelphia, Pennsylvania.

Claim—The construction of a balanced lever through which a passage to discharge the excess of condensation is opened by the weight of such excess.

284. Printing Presses; G. W. Davis, Seneca Falls, New York.

Claim—The arrangement of the double-armed lever, plate, bed, and the adjustable upright frisket.

285. Preventing Corrosion of the Binding Screws in Galvanic Batteries; George Doyle, Ottawa, Illinois.

Claim—Making the connexions of the battery by fitting the jars with covers of glass, glazed or enameled earthenware, gutta-percha, or other insulating substance, with holes in them to receive the shanks of the binding screw sockets, and screwing the said sockets through the said holes into the clamps for the plates, with interposed washers of india rubber, leather, or similar protecting material.

286. Rotary Reciprocating Knives for Smoothing Staves; Wm B. Dunning, Geneva, New York.

Claim—The arrangement and employment of the oscillating cutting tools for smoothing the stave, &c.

287. Self-loosening Horse and Cattle Tie; John J. Eshleman, Lancaster, Pennsylvania.

Claim—The bolt in two sections, connected by the sliding scarf-joint, for the purpose of instantly loosening the horse. Also, the devices of the bolt, spiral spring, and casing, all in combination.

288. Axle Boxes; Wm. B. Fahnestock, Lancaster, Pennsylvania.

Claim—The combination of the axle and boxes, for the purpose of allowing the axle to turn and accommodate the wheel to the direction of the rail.

289. Car Wheels; Wm. B. Fahnestock, Lancaster, Pennsylvania.

Claim—The wheel with the hub outside of the tread or rim, and the bearing on the axle within the tread or rim, or at the balancing point. Also, the combination of the independent wheel, bearing, and pivot, with the short axle, for the purpose of preventing the sliding and friction of the wheels on or against the rail.

290. Pneumatic Springs; Wm. R. Fee, Cincinnati, Ohio.

Claim—The pneumatic spring having a hollow metallic piston working closely in a hollow metallic cylinder, and packed by leather and oil, for the purpose of increasing the elasticity of the spring and preventing explosions and leakage.

291. Cane for Paying Omnibus Fares; Samuel W. Francis, City of New York.

Claim—Inserting pieces of money in a cane for the purpose of handing omnibus fares.

292. Lighting Gas by Electricity; Samuel Gardiner, Jr., City of New York.

Claim—Placing a coil of platinum wire, or its equivalent, in the relative position of the jet of gas, for the purpose of lighting the jet by electricity, and for re-igniting it when blown out.

293. Testing and Measuring the Strength of Car Springs; Perry G. Gardiner, City of New York.

Claim—The combination and arrangement of the plunger with the adjustable spindle, and adjustable knife edge pivot, and the guide plate, arranged and operating in connexion with balance beam, so as to test the power of the spring, and at the same time measure with great facility and rapidity the exact weight or pressure to which the spring has been subjected, the whole being adjustable to any required size or power of spring.

294. Machines for Slating Coal; T. Garretson, Pottsville, Pennsylvania.

Claim—The construction of the sides of the screen and the openings, to bring the said openings outside of the guard bars, and give to the said openings a tangential direction, and to form tangential, or nearly tangential, conductors leading to the said openings.

295. Horse Power Machines; James Grant, Rochester, New York.

Claim—Making iron horse powers with an open centre to the caps, and an adjustable or a fixed bridge piece, and making a double length or reversible pinion.

296. Constructing Dolls' Heads; Ludwig Greiner, Philadelphia, Pennsylvania.

Claim—Strengthening the seams and projecting or exposed parts of dolls' heads, by cementing or pasting on those parts muslin, linen, silk, or other equivalent material.

297. Apparatus for Manufacturing White Lead; Henry Hannen, Dubuque, Iowa.

Claim—The pipe with its branch pipes and stop-cocks, the pipes and the diffusing pipes, and their respective stop-cocks, in combination with the valves or stoppers, the whole being arranged and operated for the purpose of exposing the metal to the action of the different agents employed alternately and successively.

298. Clothes' Dryer; James J. Hamilton, New Castle, Indiana.

Claim—The application of the roller and pulleys to the arms, and the folding of the arms to the post.

299. Self-waiting Table; George W. Hagey, Smithland, Kentucky.

Claim—The handle for the purpose of turning the table, and to which a table cloth may be buttoned.

300. Sawing Mill; Wm. Hawkins and Wm. C. Clary, Milwaukie, Wisconsin.

Claim—The manner of automatically changing the saws after each cut, alternately from an oblique position in one direction to an oblique position in a contrary direction, to the line of the log carriage, by means of the studs, slide, double lever, connecting rods, in combination with the frame and the guides. Also, the use of the two wedge rollers or wedges to keep the board clear of the saw while cutting in either direction. Also, the combination of pinions and their pins entering into recesses of plates, the ratchet wheels, the adjustable segments, the wheels, the screws, and the rods, with their clutches, for the purpose of automatically setting the log to the saw, and stopping the setting when the log frame advances too close to the saw. Also, the notched plate, in combination with the latch, lever, and link, for the purpose of operating the bolt shifter without turning the lever.

301. Heating Apparatus; Francis L. Hedenberg, City of New York.

Claim—The arrangement within the case of the fire-box, spark or draft chamber, and the flue and air-pipes, the whole being surrounded by water space.

302. Railroad Car Wheels; Wm. W. Hubbell, Philadelphia, Pennsylvania, and Richard H. Hubbell, Delaware Co., Pennsylvania.

Claim—The circular vertical flanches of the rim and plate, cast separately, turned off smooth, and fitted together. Also, the central plate strengthened with ribs and made thicker around its outer edge where it is secured to the rim, in combination with the vertical flanches on the rim and plate.

303. Gas Generators; John G. Hock, Newark, New Jersey.

Claim—The arrangement together of the rain retort, chambers, and open space.

304 Composition for Coating Telegraph Wires; J. B. Hyde, City of New York.

Claim—An insulating compound for telegraphic wires, formed by mixing boiled linseed, cotton seed, or rosin oil with good natural or artificial asphaltum.

305. Straw Cutters; W. W. Hallman, Eddyville, Kentucky.

Claim—The combination of the movable bottom with the cam shaft, cams, and connecting rod, for giving a projection of straw under the knife by raising the lever, said projection being gauged and furnished by the upward and downward motion of the lever.

306. Coffee and Tea Pots; James M. Ingraham, City of New York

Claim—The steam tight coffee pot, the filterer, with the conical chamber and the siphon combined.

307 Air Heating Furnaces; T. D. Ingersoll, Monroe, Michigan.

Claim—Constructing the radiator and arranging the dampers within it, so that the dampers may perform the double function of dampers and scrapers.

308. Churn; John A. Jordan, Shelbyville, Tennessee.

Claim—The employment of the revolving wheel and stationary wheel, constructed and operating in the churn, the bottom of the same being fitted in a stove casing.

309. Combination of Lead Pencil and Eraser; H. L. Lipman, Philadelphia, Pennsylvania.

Claim—The combination of the lead and india rubber, or other erasing substance, in the holder of a drawing pencil.

310. Scissors' Sharpener; J. C. Loveland, Springfield, Vermont.

Claim—As a new article of manufacture, the instrument for sharpening scissors, consisting essentially of the revolving file and guide.

311. Diving Bells; Benjamin Maillefert, Astoria, New York.

Claim—The combination of the reservoir with the bell and tube.

312. Lathe Chuck; John L. Mason, City of New York.

Claim—The chuck for spinning screw caps, having a flanch, a rounded thread, and a rounded groove, and the thread vanishing gradually at the flanch.

313. Windlasses; Joseph P. Manton, Providence, Rhode Island.

Claim—The arrangement of the pawls, wheel, hub, ratchets, and gearing.

314. Washing Machine; James McVicker, Green Co., Pennsylvania.

Claim—Forming a receptacle within the wash-box for containing the clothes to be steamed, preparatory to their being washed, by means of the ribs or slats attached to the wash-box, and the ribs or slats attached to the lid, so that upon opening the lid of the wash-box the receptacle is also opened for the introduction or removal of the clothes.

315. Ticket-holders for Railroad Cars; M. L. Mickles and L. S. Olmstead, Aurora, Illinois.

Claim—A ticket-holder composed of two chambers or compartments, into the upper one of which the ticket is placed and exhibited, and thence transferred to the lower one in the act of closing and opening the door of said upper compartment, by means of the movable floor and ledge or projection.

316. Wrench; Archibald Murray, Troy, New York.

Claim—My improved adjustable wrench, in which the movable jaw is fastened to the fixed one, by means of a ring or collar which surrounds and slides upon the shanks of both jaws together.

317. Desk Seats for Schools; Charles Perley, City of New York.

Claim—Supporting the seat by a bracket extending from the pedestal or column of the desk, whether said seat be a permanent fixture or fitted to swing around, whereby the floor is unobstructed by the separate legs or pedestal of the seat, and greater facility afforded for clearing the room and more space given for the feet of the scholars.

318. Brick Machine; J. L. Ransom, Charleston, South Carolina.

Claim—The box provided with the follower, in combination with the roller frame, feeding bar, and scraper. Also, the adjustable roller, arranged as shown, and operated by means of the cams on shaft.

319. Sewing Machines; O. L. Reynolds, Dover, New Hampshire.

Claim—The loop distender, operated by, and operating in combination with, the shouldered looper.

320. Railroad Car Couplings; John W. Rice, Springfield, Massachusetts.

Claim—The fulcrum-drop and notches on the under side of the hook link and the rod, when used in combination with each other.

321. Railroad Brakes; John C. F. Salomon, Baltimore, Maryland.

Claim—1st, The employment of small auxiliary wheels between the main wheels of the locomotive and several cars of the train, said wheels being adjustable up and down. 2d, The combination with the said auxiliary suspending and compensating wheels of a brake.

322. Stoves; Silas T. Savage, Albany, New York.

Claim—In furnaces or stoves the employment of a receptacle for the fuel, closed at front and partially at bottom, with open grate bars for a part of its bottom and for the rear, opening into an air or draft chamber between them and the back plate of the fire chamber.

323. Casting Types for Printing; George Schaub, Hamburgh.

Claim—Manufacturing types for printing by casting the stems or bodies of the types at the back of a sheet of type heads, and finishing the same; also, the manufacture of spaces used in setting up printing types by the use of the movable frame.

324. Applying Pendulum Power; Andrew Slevin, Ann Arbor, Michigan.

Claim—The peculiar combination of the pendulum, bevel wheels, pawls, and ratchets, for the purpose of obtaining a rotary motion from the reciprocating motion of the pendulum.

325. Manufacture of Tubular Wrought Iron Shafts; W. A. Stephens and Richard Jenkins, Covington, Ky.

Claim—The manufacture of wrought iron bars for tubular axles, shafting, or other purposes, by rolling from a solid pile in a system of grooves, by which the pile is first flattened, then grooved longitudinally, and afterwards has the sides of its groove closed together and welded.

326. Machine for Shelling Peas; William J. Stevenson, City of New York.

Claim—The combination of the rollers and endless cords.

327. Cross-cut Sawing Machine; George Telford, Pike, New York.

Claim—The bar with the saw attached, the arm, connecting rod, and wheel, when arranged relatively. Also, the bar and saw, in combination with the log carriage and cylinder, grooved and armed with spikes.

328. MASTIC COMPOSITION; Joseph Thompson, North Wrentham, Massachusetts.

Claim—The right of using the naturally finely divided remains of silicious rocks which have an alkaline action on test paper, as fullers' earth, instead of sand, gravel, or other solid material.

329. HARVESTERS; Wm. Van Anden, Poughkeepsie, New York.

Claim—The use of a rectilinear spring, in combination with the detent cam, having guides on the face thereof, for the purpose of actuating the cutter of a harvester machine endwise in opposite directions from a state of rest, by the impulsive stroke of the spring, which said spring is charged by its opposite curvatures, while the cutter remains at rest. Also, the employment and use of the cam wheel, having on its face guides, in combination with a crank shaft, for the purpose of giving two vibrations to the cutter to one revolution of the cam wheel. Also, the combination of the spring (or springs as may be used,) with the cam wheel, crank shaft, and vibrating lever, attached to the cutters, for the purpose of operating the same.

330. TEMPERING AND HARDENING STEEL AND IRON; Horace Vaughan, Providence, Rhode Island; patented in England, December 29, 1856.

Claim—The use of a bath of chloride of sodium with or without ferro-cyanide or bi-chromate of potash or either of them, or of other ingredients possessing similar chemical properties, combined with animal, vegetable charcoal and ground bone, when the foregoing substances are in a state of igneous fusion.

331. WOOD SCREWS; James M. Whiting, New Bedford, Massachusetts, and Geo. F. Wilson, Providence, R. I.

Claim—The making of wood screws with the upper side of the thread of greater depth than the under side of the thread.

332. ROTARY CUTTER FOR TONGUING AND GROOVING; James A. Woodbury, Winchester, Massachusetts.

Claim—The combination of the chisel cutter or cutters with the lip cutter or cutters.

333. MILLS; Joel Woodward, Philadelphia, Pennsylvania.

Claim—1st. The mode of the bush on the plate running up inside of the balance ryne. 2d. The mode of the lower stone working on a loose or balance ryne, that has a nut or breaker resting on, or fastened to, the top of it, and may work with or without a balance or upper bearing 3d, The manner of the inside pot or teeth made to raise and lower, to open and close the aperture, by means of the lever (or screw) to regulate the feed of the stones and grinding of the crusher or breaker.

334 SEED DRILLS; George S. Ball, Assignor to Benjamin Kuhns, Dayton, Ohio.

Claim—The slide with the attachment of the clips in combination with the slides.

335. CORN SHELLERS; Peter Bergen, Assignor to Jane Ann Bergen, City of New York.

Claim—The combination of the delivery flap on bottom of the hopper, the piece, the pins on the shelling cylinder, the cradle and the springs.

336. RAILROAD CAR WHEELS; Henry C. Bulkley, Assignor to James M. Ross, Springfield, Massachusetts.

Claim—1st, My mode of constructing the hub, viz: by reducing the iron around the outer periphery of the hub and to give the requisite strength, I substitute a flanch or ring on the end of the hub, when used in combination with a railroad car wheel with one or more plates. 2d, Increasing the thickness of the disk as it recedes from the hub to the thread of the wheel.

337. PRESSES; Simon Ingersoll, Assignor to self, S. B. Turner, and George W. Kimball, Brooklyn, N. York.

Claim—The levers, chain I, shieve J, when arranged on the beams.

338. MANUFACTURE OF HOES; Judson Knight, Newark, N. Jersey, Assignor to R. W. Booth, Providence, R. I.

Claim—The welding of a wrought iron plate between the steel blade and the malleable cast iron eye, or in other words, I claim the hoe constructed of the three pieces, arranged relatively to each other and welded together.

339. STEERING APPARATUS; Isaac Moore, Assignor to self and Francis N. Grove, Brooklyn, New York.

Claim—The manner of relieving the rudder stock of any sudden strain or concussion by the endwise motion allowed to the screws, in combination with the springs, or equivalent yielding pressure.

340. HAND EXERCISER FOR MUSICIANS; Jules Monestier, St. Denis, near Paris, France, Assignor to R. F. Spangenberg, Brooklyn, New York.

Claim—Giving agility and suppleness to the fingers, hand, and wrist of musicians, by the exercise induced by the application of my "agili main."

This invention consists in applying weights to the wrist or fingers, or both.

341. PERMUTATION LOCK; John H. Morse, Assignor to self and Lester Patee, Peoria, Illinois.

Claim—The "blind" or shallow slots, or their equivalents, in the circular plates, made and arranged so as to receive the points of projections on the bar.

342. MACHINES FOR BURRING WOOL; T. Musgrave, Leeds, Assignor to Anna Musgrave, Northampton, Mass.

Claim—The combination of the second burring cylinders and its beaters with the first burring cylinder with its beaters, by means of an interposed stripper, or an equivalent therefor.

343. ATTACHING THE PLUMB LINE TO A PLUMB AND LEVEL INDICATOR; John L. Rowe, Assignor to Frederick Stevens, City of New York.

Claim—The attachment to a plumb and level indicator of the reel and cord.

344. SEED PLANTERS; Samuel Thompson, Assignor to self and A. W. Taggart, Hopedale, Ohio.

Claim—The cutter attached to the wheel of the framing, in combination with the seed distributing slides, operated by the cams attached to the cutter wheels.

345. LIGHTNING CONDUCTORS; Oren White, Assignor to Henry C. Janes, Racine, Wisconsin.

Claim—1st, The lightning conductor consisting of iron wires enwrapped by sheet copper, for the purpose of increasing the strength and the conducting power of the rod without materially lessening its flexibility or greatly increasing the expense of manufacture. 2d, The sheet metal joint or clutch for connecting additional rods or points to the main rod.

346. HUBS OF CARRIAGE WHEELS; James M. Whiting, New Bedford, Mass., Assignor to self, Geo. F. Wilson, and Alfred Anthony, Providence Co., Rhode Island.

Claim—The making of the hub an elastic compound cylindrico-lever, each end of which rests for a fulcrum on vulcanized india rubber or gutta-percha, or other elastic substance, in combination with the coupling

nut, by which the pressure thereon may be regulated. Also, the grooves in the body of the hub, or their equivalents, and the projections on the outside of the box, or their equivalents, in combination with the said elastic substance.

347. Cotton Presses; Henry Shrader, Burnsville, Alabama.

Claim—The construction and combination of the double racks with the toggle joints. Also, the hinge connecting the lower ends of the toggle levers with the follower, in combination with the operation of the levers, by which both followers are operated at the same time and with the same application of power.

Additional Improvements.

1. Steam Ploughs; Pierre Klingle, Washington City, D. C.; patented February 23, 1858; additional dated March 9, 1858.

Claim—The placing of clearers in connexion with the off bearing wheel of my steam plough, in such a manner that the one will fill back the furrow that the other has opened.

2. Cutting Flour Mills; Jonathan Burdge, Cincinnati, Ohio; patented June 10, 1856; additional dated March 9, 1858.

Claim—The doubly conical concavity in, and cutting ridges on, the face of the cutter head, arranged and acting in combination with the concavity and ridges of the counter plate. Also, extending the ridges inward beneath the feeding aperture of the counter plate, in combination with the inner conical concavity of the cutter head, and with the counter plate.

3. Clasps for Metallic Hoops; James R. Speer, Pittsburgh, Pennsylvania; patented Dec. 1, 1857; additional dated March 23, 1858.

Claim—Bending the ends of the clasp across the apertures, so as to present an opening in the clasp for the insertion of the bent ends of the bands at right angles, or nearly so, to the direction in which the bands are inserted in the clasp.

4. Hanging Carriage Bodies; J. M. Jones, Palmyra, New York; patented July 22, 1857; additional dated March 30, 1858.

Claim—The combination and arrangement of the disk or fifth wheel, attached to the front axle, the embracing circularly flanched annular disk, with its laterally projecting arms or trunnions, to which are attached the bars or spring levers, so as to preserve the horizontal position of the fifth wheel while allowing the necessary play of the said bars.

5. Automatic Railroad Car Brake; W. R. Jackson, Baltimore, Maryland; patented September 8, 1857; additional dated March 30, 1858.

Claim—The arrangement of parts, or its equivalent, for the simultaneous compression of the forward and rear springs, and the consequent operation of the brakes, the same consisting in the combination of the lever with the slide bar and pushing rods.

Extension.

1. Suspending, Opening, and Closing Lock Gates; Henry McCarty, Pittsburgh, Penna.; patented March 16, 1844; extended March 16, 1858.

Claim—The mode of suspending, and opening, and closing gates for locks, and other places, by means of the combination and arrangement of the inclined post, rod, swivel, stirrup, and hog chains, and the triangular hinged lever, segment way, cord, pulleys, and windlass, by which the expense of construction is reduced, and the old railway and rollers at the bottom of the lock, and the chains for opening and closing the gates placed in the water, where they are subject to constant oxidation and breaking, and where they cannot be reached without much difficulty when out of order, are entirely dispensed with.

Re-Issues.

1. Machine for Making Barrels and other Casks; Isaac Crossett, Bennington, Vermont; patented July 1, 1844; re-issued March 2, 1858.

Claim—The vibratory block or bed, adjustable gauge, and knife or cutter, arranged relatively with each other so as to operate.

2. Running Gear for Locomotive Engines; Septimus Norris, Philadelphia, Penna.; patented Sept. 28, 1854; re-issued March 2, 1858.

Claim—So arranging the running gear of a locomotive engine, as to make the driver support its outer weight, in combination with a pilot truck vibrating freely to guide the engine.

3. Life-preserving Rafts; Lorenzo Taggart, Philadelphia, Pennsylvania; patented Jan. 26, 1858; re-issued March 2, 1858.

Claim—A life-preserving raft formed by the ordinary water casks or tanks of ships, having eyes secured thereto so as to be air-tight, and connected by spring stay-rods, in combination with a rope net work and canvas sheet.

4. Gas Tube Joint; Charles Monson, New Haven, Connecticut; patented January 19, 1858; re-issued March 9, 1858.

Claim—A conduit universal joint made with the armed branches, G H, and their connexion, cross-jointed together, and provided with one or more passages, so arranged in them as to open a communication from one leading tube, A, to the other, B, with which such conduit joint may be connected. Also, the combination of the relief ring, C, or its equivalent, with the armed branches and the connexion cross, the same being arranged therewith.

5. Lard Lamps; Isaac A. Coffin, Washington City, D. C.; patented March 17, 1857; re-issued March 16, 1858.

Claim—The combination of the hot air chamber which is formed by the arrangement of flat inclined wick tubes. Also, the combination of the flat inclined wick tubes with the concave reflector; my invention having special reference to a lard lamp.

6. Machine for Making Hat Bodies; Wm. Fasket, Meriden, Connecticut; patented Jan. 23, 1846; re-issued March 23, 1858.

Claim—The automatic method of forming hat bodies, having the required variation in thickness at their

different parts, by supplying picked fibres to an exhausted former of the size and shape required, in such manner that a larger portion of picked fibres is supplied to that part of the former which corresponds with the thickest portion of the hat body, and a less portion to the other parts of the former. Also, the combination of a picking apparatus, a hat body former, an air exhausting apparatus, and a conductor. Also, a bow string picking apparatus, constructed and operating to pick fur presented to it by a suitable feeding and nipping apparatus.

7. Employing Centrifugal Force in Casting Iron Pipes; Thomas J. Lovegrove, Baltimore, Maryland; patented Dec. 26, 1848; re-issued March 23, 1858.

Claim—Forming pipes or other castings by centrifugal force, by causing the mould into which the liquid material is poured to revolve.

8. Grain Separators; John R. Moffit, St. Louis, Missouri; patented Nov. 30, 1852; re-issued March 23, 1858.

Claim—1st, The endless chains, composed of metallic links provided with protuberances or depressions when used in combination with suitable driving pinions to impart a positive motion to the straw carrier of a threshing or separating machine. 2d, In combination with a receptacle in which the tailings are deposited by the winnowing apparatus; also, the arrangement of the screw elevator in relation to the threshing cylinder, for the purpose of returning the tailing to be re-threshed.

9. Railroad Car Wheels; Wm. B. Treadwell, Albany, New York; patented January 9, 1849; re-issued March 30, 1858.

Claim—The forming of such wheels with a hollow concentric annulus or ring, the plates forming a curve to yield by bending to the unequal contraction, in combination with the connexion thereof with the rim at or near the middle of its width, by means of the solid ring to give the required support to that part of the rim which is most exposed to fracture in use. Also, in combination with the hollow annulus or ring connected with the rim by a solid ring, the inner hollow annulus or ring next to, and connected with, the hub, and connected with another hollow annulus or ring by a solid ring, whereby ample provision for yielding to the unequal contraction is obtained, while at the same time the metal composing the wheel is so disposed as to prevent in a great measure the injurious effects of vibrations, and to resist the jars and concussions to which the railroad wheels are exposed in use.

Designs.

1. Carriage Hub Sand Bands; James Ives, Mount Carmel, Connecticut; dated March 9, 1858.

Claim—The curved form or ornamental configuration of carriage hub sand bands.

2. Copying Press Stand; Charles H. Clayton, City of New York; dated March 23, 1858.

Claim—The press stand foot, consisting of the harp or vase-shaped figure formed by the two reverse curved bands, with the shell, the two figures, and the joining scrolls, all supporting and connected with each other, and forming one harmonious design.

3. Legs and Posts of Iron Bedsteads; John P. Kock, City of New York; dated March 23, 1858.

Claim—My design for feet and posts for iron bedsteads, consisting of the scroll work, stand and brace, with a praying angel kneeling between the latter, for the posts of iron bedsteads, and the figure of an eagle, with outspread wings, resting upon arabesque scroll work, and carrying a corresponding capital on its head, and the ends of the wings for the centre feet.

APRIL 6.

1. Corn Harvesters; Isaac V. Adair, Varick, New Jersey.

Claim—Attaching the cutter to the rods, the rods being provided with arms, and the rods and arms operated from the wheels through the medium of the gearing and arms, when the above parts are used in combination with the stationary cutters, at the inner parts of the recesses. Further, the bar provided with the arms, in combination with the gate, the above parts being attached to the platform, and used in connexion with a railing or guard. Also, the cutting device formed of the cutters connected with rakes or teeth, in combination with the discharging device formed of the gate and bar.

2. Sewing Machines; Abraham Bartholf, City of New York.

Claim—The construction of the taper portion of the shuttle, and the forked portion of the shuttle driver which acts upon it to drive it back, so that the said portion of the driver bears upon the top and bottom of the shuttle with a tendency to draw it away from or prevent it hugging the side of the race way. Also, giving the two claws which produce the backward motion of the shuttle, a relative form, by which the shuttle is prevented hugging the bottom of the race way.

3. Syrup Casters; Edmund Bigelow, Springfield, Massachusetts.

Claim—The measuring faucet or register, in combination with the revolving syrup fountain or reservoir.

4. Traps for Animals; John Le Brabyn, City of New York.

Claim—A tilting platform, in combination with the enclosed recess, when the platform is comprised of the inclined plane and horizontal floor.

5. Grinding Mills; D. E. Breinig, Philadelphia, Pennsylvania.

Claim—1st, The upper portion of the grinding surface of the shell and buhr cone-shaped, with inclined sides terminating in a horizontal curved grinding surface, in combination with the deflecting arms. 2d, The shell and buhr formed, in combination with the scraper, sliding segments, and pinions.

6. Apparatus for Roasting Coffee; Robert Brown, Ashtabula, Ohio.

Claim—The vessel, provided with the adjustable rotating scrapers or blades attached to rods of varying lengths, which rods are pivoted to the shaft.

7. Churns; Harvey Brown, City of New York.

Claim—The arrangement of the trailing paddles, wheels, and gearing.

8. Attaching Expansible Cutting Lips to Augers, &c.; Nicholas Clare and John Quigley, Malden, N. Y.

Claim—The detachable and adjustable reamer or plug borer.

9. Clasps for Fastening Bags; Wm. H. Cloud, A. L. Hatfield, and C. H. Burdick, Fremont, Ohio.

Claim—The peculiar construction of semicircle with thin edge to prevent slipping, and hinge at one side, clasp and catch on the other side; the peculiar construction of lever, so as to be operated upon by the pressure of the bag when fastening, and thumb-piece, by which it is easily opened.

10. PEN AND PENCIL CASES; John Cockburn, City of New York.

Claim—The arrangement and combination of a pen-slide, which girdles its tube with a boss, which latter girdles its tube.

11. SECURING POCKET-BOOKS, &c.; Oliver Cox, Alexandria Co., Virginia.

Claim—The lock constructed and attached to the pocket-book, &c., in combination with the button, for the purpose of attaching pocket-books, porte-monnaies, and purses to the pocket of the wearer.

12. HAND CORN PLANTERS; Daniel C. Coppin, Cincinnati, Ohio.

Claim—The combined arrangement of the concave plate, lever, and seed rod, arranged with the pipes and spring.

13. PORTABLE PUMP; Wm. Douglas and Benjamin Douglas, Middletown, Connecticut.

Claim—The pipes and the chamber, provided with the flexible cover and lever, and the caps; the parts being constructed and arranged relatively with each other.

14. SAW GUMMER; M. Ernsberger, Bremen, Ohio.

Claim—The stock provided with the screws, also provided with the tube, collar, pin, and the shaft, with cutter formed on it.

15. HARDENING IRON AND STEEL; George James Farmer, Birmingham, England; patented in England, August 23, 1856.

Claim—The hardening of articles formed of iron or steel, by plunging them into a solution of prussiate of potash, sal-ammonia, and saltpetre, after they have been heated red hot, and rolled in a powdered mixture of the same materials.

16. REFRIGERATORS; Wm. Ferris, Philip Garrett, and James Megratten, Wilmington, Delaware.

Claim—The combining the third or inner box or frame with the interior of a refrigerator, so that a perfect circulation of cold air may be kept up in the interior of the box or case.

17. COTTON PRESSES; Wm. Field, Providence, Rhode Island.

Claim—1st, The arrangement of the chains connecting the followers, so that by applying power and motion to one follower it is transmitted to the other; and also, the followers retain their parallelism to each other, however unequal the resistance at either end. 2d, The combination of the screw for raising the upper follower with the chains for raising the lower. 3d, The guard plates, in combination with the followers.

18. SEEDING MACHINES; Joseph Fry, Battle Creek, Michigan.

Claim—The device of using a screw with double thread, coarse and fine, alternately, in the bottom of the seed hopper, in combination with the oscillating hand lever and the eccentric pivot, to force the seed through the holes in the perforated bottom of said seed hopper, by means of the compound oscillating motion of the screw.

19. BOX-CASES AND LUBRICATORS FOR RAILROAD CAR AXLES; G. W. and J. C. Geisendorff, Cincinnati, Ohio.

Claim—The employment of the divided packing, in combination with the springs.

20. PROTECTING TILLER ROPES OF VESSELS FROM FIRE; W. Y. Gill, Henderson, Kentucky.

Claim—Enclosing the tiller ropes of steam vessels, by a double tubing connected with double boxes to form the necessary elbows, the spaces between the tubes and boxes being filled with a proper non-conducting material.

21. PIPE TONGS; Henry H. Gilmore, Boston, Massachustts.

Claim—The combination of an inclined plane or planes, or the equivalent thereof, with the slotted jaw.

22. PUDDLING FURNACES; John P. and John Grove, Montour County, Pennsylvania.

Claim—1st, The employment of a revolving bottom for a puddling furnace, arranged with water tubes for cooling it, and with the peculiar air-tight joint. 2d, The employment in a puddling furnace of a revolving tool.

23. BOOT-JACK AND BURGLARS' ALARM COMBINED; F. C. Goffin, Newark, New Jersey.

Claim—The bed, jaws, treadle, pendant, slide, and spring, whereby the article serves the double purpose of a boot-jack and door alarm.

24. LANTERNS; A. H. Golden, Lafayette, Indiana.

Claim—The bow or ball pivoted to the upper part of the lantern, and provided with the plate or shield and clamp, whereby the lantern may be readily secured to the arm of the person desiring its use, and the person have the control of both arms and hands, and at the same time have the full benefit of the light.

25. HORSE COLLAR BLOCKS; E D. Gould, Darien, New York.

Claim—A collar block so constructed as to shape the interior of the front of the collar, and the interior of the rear of the collar next to the front, and the interior only, and stretch them at the same time, and hold them firmly in the form required, while the rear or belly of the collar is manipulated by hand, and worked and beat into the form required with a mallet, and other suitable tools.

26. RAILROAD STATION INDICATOR; N. J. Becker, Florida, and J. M. Harvey, Amsterdam, New York.

Claim—1st, The arrangement of a series of separated, printed, indicating cards, plates, or boards, on a flexible endless belt or chain, and having the same revolve over a flat, square, or many-sided revolving shaft within a case which has a transparent front. 2d, The employment of a self-adjusting forked rod leading down to the railroad rails, and furnished with a catch on each prong, in combination with projections on the corners of the square or many-sided shaft, a reversing cam, and double inclines or bevel stops, arranged along she track at the different stations or streets. 3d, The combination of a spring, self-adjusting bell hammer, and bell, with the square or many-sided shaft and its projections.

27. CONVERTING RECIPROCATING INTO ROTARY MOTION; Forest H. Harwood, Rushville, New York.

Claim—The arrangement of a revolving eccentric ring or band, with edge clips of a reciprocating rod, or its equivalent, for operation together to produce a revolving motion from a reciprocating one, and the reverse. Further, the combination with the reciprocating clips of the rod having a radial action to the ring shaft of the endless band, arranged eccentrically to its shaft, when said band is made of diminishing thickness in opposite directions from its dead points or portions, for operation with the clips. Also, connecting the revolving eccentric ring or band that reciprocates the clips, or is revolved by them with its shaft, by or through the fly-wheel which aids the ring in passing its dead points or centres, whereby the fly-wheel is braced by the ring, and more immediate relief is given to, and generally diffused over, the latter.

28. Potato Diggers; Lewis W. Harris, Waterville, New York.

Claim—The employment or use of a share and drag. Further, in combination with the share and drag, the supplementary shears.

29. Reefing Sails; Lewis Higgins, Jersey City, New Jersey, and Alexander Brown, City of New York.

Claim—1st, The truss frame, constructed and fitted with a series of rollers, which embrace the yard and rolled-up portion of the sail to hold the yard to the mast, but to permit the rolling of the sail thereon without the necessity of dividing the sail down the centre. 2d, The combination of the rings which carry the traveling leads with the yard and with the truss, by means of the collared bands and the rolling stays, to prevent longitudinal movement of the yard, and the rolling of the traveling leads with the yard.

30. Row Locks; James H. Hills, Burlington, Vermont.

Claim—The arrangement and combination of half rings and set or adjusting screws, and the suspension and operation of the oar at point.

31. Coupling Pipes; W. Hudgin, Washington City, D. C.

Claim—Effecting the combination of the main and branch pipes, by means of an open coupling, which is furnished with an enlarged passage to receive the main pipe, a passage to receive or communicate with the branch pipe, and a set-screw or wedge and key, and suitable packing to make a tight joint, and always maintain the same.

32. Holding and Feeding the Bolt in Stave Machines; A. Hupp, Lancaster, Ohio.

Claim—The combined arrangement of the levers, catch rod, and slides, arranged with the lever and pawl, ratchet wheel, cord and plate, all for holding and feeding the timber to the cutter.

33. Machine for Cutting Files; J. N. Jacobs, Worcester, Massachusetts.

Claim—1st, The wedge at the top of the toggle, by which the cutter is operated and combined with a foot-piece, with its shoe resting upon the file blank or file, by means of mechanism, and with a loaded lever, for the purpose of controlling the depth of cut throughout the whole length of the file. 2d, Supporting the file blank or file upon a rolling bed fitted to a carriage with rollers interposed, for the purpose of insuring an uniform depth of cut all across the file. 3d, The combination of the rocking shoe of the foot-piece with the rolling bed. 4th, The cam combined with the wedge foot-piece and shoe, by mechanism, for the purpose of raising the cutter and the shoe of the foot-piece from the file or blank, to prevent injury during its return.

34. Ice Pitcher; Ernest Kauffman, Philadelphia, Pennsylvania.

Claim—The ice pitcher, having the inner portion or lining fitted to the outer portion or casing with screw threads, which make a tight joint, but provide for its ready removal and replacement or renewal.

35. Machine for Crimping Tobacco; R. Kinsley, Springfield, Massachusetts.

Claim—The employment of one or more pairs of rollers for equalizing and crimping rolls in the manufacture of lump tobacco.

36. Piano-forte Action; Henry A. Leaman, City of New York.

Claim—1st, The attachment of the hammer of an upright piano-forte action to the rear extremity of the key, and the arrangement of the notch in the back side of the butt of such hammer, so that the working face of the notch is in contact with the edge of a stationary bar, and by such operation cause the hammer to move back to strike the string, when the front end of the key is depressed. 2d, In combination with the attachment of the hammer to the rear extremity of the key, the attachment of the damper to the hammer butt below the pivot, which attaches the hammer to the key, whereby it is made to serve as a stop to the hammer, or means of regulating the length of stroke of the hammer, and depth of level of the key. 3d, The application of the regulating screw in the rear end of the key, to operate in combination with a portion of the hammer butt, extended below the pivot which attaches the butt to the key. 4th, The arrangement of the damper lever, behind the downwardly extended portion of the hammer butt.

37. Atmospheric Pressure Dental Plates; M. Levett, City of New York.

Claim—Attaching plates of artificial teeth by means of separate cells or cavities acting upon the alveolar ridge.

38. Seeding Machines; Isaac B. Lutz, Lafayette, Indiana.

Claim—The rotating rods provided with two screw threads placed in reverse positions, and so arranged as to discharge the seed at both ends of their seed boxes. Further, the seed boxes attached respectively to the adjustable bars and beam, and provided with seed distributing screw-rods, operated from the driving wheel through the medium of the gearing.

39. Smut Machines; Samuel B. Manning, Alleghany City, Pennsylvania.

Claim—The use of a cone placed above the distributing cup to prevent any eddy or interruption of the draft of air, which cause the deposit of the screenings and dirt in the cup.

40. Vise-anvil for Repairing T-rails; Sanford Mason and E. M. Davis, Michigan City, Indiana.

Claim—The combination of the guard on the lever jaw, and the groove in the bed-piece, with a raising mechanism for raising up said lever jaw. Also, in combination, the projection on the lever jaw, and the groove on the locking jaw, so that when the jaws are raised up they will open to receive the rail, and when released will catch and firmly hold themselves and the rail to the bed-piece.

41. Corn Shellers; Thomas W. McFarlan, Salem, Ohio, and Levis H. Davis, West Chester, Pennsylvania.

Claim—1st, The gutter-shaped guard, arranged between and underneath the bevel picker wheels, and overlapping the head of the vibrating riddle. 2d, Having the head end of the riddle rest upon a horizontal projection of an inclined board. 3d, Lining the spouts or chutes of the head with a thin, pivoted, or yielding metal lining.

42. Fence Post; R. Merrill, Elmira, New York.

Claim—The shoe or foot plate with deflected parts and slotted openings, in combination with the skeleton post and flanches.

43. Harvesters; W. K. Miller, Canton, Ohio.

Claim—The combination of the draw bar and cutter bar, when the same are balanced upon the sustaining shoe, and hinged to the axle of the driving wheel, distinct from the hounds of the draft tongue, with the tongue so attached that the line of its draft will be equi-distant from the central longitudinal lines of the driving wheel and sustaining shoe, the several parts being constructed and arranged with respect to each other.

44. THRESHING MACHINES; John R. Moffit, St. Louis, Missouri.

Claim—The construction and arrangement of the metallic gearing frame, provided with arms and attached to the machine.

45. COATED METAL PLATES; Edmund Morewood and George Rogers, Enfield, England; patented in England, July 27, 1855.

Claim—The new article of manufacture, termed coated metal plates, consisting of sheet metal prepared and coated with a mixture of repellant and preservative coating, the said coated sheet metal being intended as a substitute for many purposes for tin plates, galvanized iron, or other articles of that description, produced by dipping sheets of metal into melted metals.

46. MACHINE FOR SPLITTING WOOD; Franz Nöette, Brooklyn, New York.

Claim—The intermittingly rotating table or bed, in combination with the vertical reciprocating cutter shaft.

47. REMOVABLE RAMMER OF REVOLVING FIRE ARMS; Henry S. North, Middletown, Connecticut.

Claim—Having the rack and passage or chamber made in the head of the base pin, thus rendering the rammer independent of every other part and facilitating its removal.

48. MACHINES FOR PLANTING POTATOES; Jesse W. Pelletrean, East Moriches, New York.

Claim—The general arrangement of the hopper and automatic dropping apparatus, consisting of the spouts, clappers, wheels, and blocks, in connexion with the opening and covering ploughs, whereby the potatoes or pieces of potato being fed into the machine by hand are not injured, and all the advantages of hand planting are attained, without the laborious work connected therewith.

49. CROSS-CUT SAWING MACHINES; H. H. Potter, Carthage, New York.

Claim—Operating the saw by means of the bent lever, in connexion with the feeding device formed of the levers and guide.

50. SEEDING MACHINES; Thomas A. Risher, Circleville, Ohio.

Claim—The peculiar arrangement of the bars, with the right and left screws, slides, with its stirrer, for the purpose of regulating the quantity of grain with uneven slides.

51. SEEDING MACHINES; Thomas A. Risher, Circleville, Ohio.

Claim—The peculiar arrangement of the bottom, as constructed, with the rock slides, handles, rods, set-screw, and bottom.

52. FIELD-FENCE; Benning Rowells, Ossian, New York.

Claim—The method of connecting the panels and the braces with each other, by interlocking the upper and lower rails with the brace post, whereby the panels are firmly connected with each other, and interlock with the posts, without the aid of independent connecting devices.

53. COTTON SEED PLANTERS; James Ross, Midway, Alabama.

Claim—The combination of the hollow shaft and arms, flanches, shaft, discharge plate, and mechanism vibrating the same.

54. WALLET FASTENER; Jacob T. Sargent, Carlinville, Illinois.

Claim—The combination of the spring catch and the attachment plate, the same constituting a safety apparatus. Also, arranging the spring catch and attachment plate, and making the said catch with a bend or recess, disposed with respect to the attachment plate.

55. SEWING MACHINES; Elliot Savage, Berlin, Connecticut.

Claim—Forming a chain-stitch seam by the looper, when operating in combination with an eye-pointed needle, so that the looper shall enter the open loop as the needle rises, and while resting on the bed plate securely hold the first loop open in the path of the needle, and release the loop when the needle shall have entered to form a new stitch. Also, the specific device for regulating the tension of the thread in sewing machines, consisting in a spool supporting bracket, in relation to, and operating in, connexion with a screw-threaded standard, in such a manner as to ascend or descend when rotated around and upon said standard, for the purpose of causing the thread to be wound around said screw until the requisite degree of tension is obtained.

56. GRAIN SEPARATORS; Francis Schunks, York, Pennsylvania.

Claim—The screens, placed in adjustable frames, operated by the cam, levers, and springs, and arranged relatively with each other and the fan, spout or passage, and board.

57. PLOUGHS; Thaddeus S. Scoville, Elmira, New York.

Claim—The combined arrangement of the loosely turning spur wheels, the separating washers, and the clearing teeth, acting upon, or close to, said washers, so that the eccentric movements of the said spur wheels, together with the said closely fitting washers and clearing teeth, will effectually keep the implement free from impediment.

58. LOCK; E. M. Shaw, Baltimore, Maryland.

Claim—The plate, spring plates, pins, and hollow stem.

59. RAILROAD STATION INDICATOR; Charles J. Smith, North Prairie, Wisconsin.

Claim—The shifting lever or bar, and the mode of adjusting it by means of the index finger at the end of the crank shaft, in such manner as to cause the rollers or cylinders to revolve in opposite directions, by means of the same application of power, in combination with the pin or stops upon the lever, and the slots or openings in the aforesaid shifting lever or bar.

60. HAND PRINTING STAMP; Benjamin B. Stanton, City of New York.

Claim—Moving the die from the inking pad to the printing pad and backwards, by means of the spool through which the stamping rod passes, operating in a straight line between parallel guides, arranged for that purpose upon a stationary arm over the inking and printing pads. Also, in combination with the sliding spool, the catch.

61. CARPET HOLDER; Horace Thayer, Warsaw, New York.

Claim—The arrangement of the spring, tube, clasp, and slide, forming a carpet holder.

62. IRONING TABLE; Wm. Vandenburg, City of New York.

Claim—The ironing table composed of a board rigidly attached at one end to a stand, which is provided with a movable support for the other end of the board.

63. Harvesters; Isaac Van Doren, Somerville, New York.

Claim—The arrangement and connexion of the movable part with the fixed part, by means of the two connecting curves, to secure proper motion to the part, without any necessary support or connexion from the centre. Also, the parts, and the secondary movable part, to bring the sickle, whatever its position on the curve, level with the cutting surface. Also, in combination with the parts, the use and application of the universal joint in connecting the sickle lever to the machine to allow of the change in the position of the sickle.

64. Lamp Attachment; Wm. W. Wade, Long Meadow, and Charles Burnham, Springfield, Massachusetts.

Claim—Securing the deflector into the groove of the chimney band, the said band being hinged to the lamp cap.

65. Ploughs; J. C. Williamson, Washington, Georgia.

Claim—The combination of the plough iron, brace, and cutter or share, when formed and united together, and to the beam.

66. Coupling of Shafting for Propellers; Seth Wilmarth, Charleston, Mass., Samuel L. Hay, Reading, Pennsylvania, and David N. B. Coffin, Jr., Newton, Massachusetts.

Claim—The combination of plated, or its equivalent, with the head plates of the shaft, so that the coupling may accommodate itself to the angular and transverse variation between the driving and driven parts of the shaft, whether that variation be variable or permanent.

67. Pistons for Steam Engines; Ross Winans, Baltimore, Maryland.

Claim—The combination of self-setting packing, that, unaided by the skill of the engineer, will adjust itself into close contact with the cylinder, and bear against the same with the proper force; of means for binding this packing firmly in place when it has set itself out, and for slackening it again when necessary to allow it to rest itself; and of means by which the packing can be easily loosened and tightened, without removing the cylinder head, whereby the packing of the piston of a locomotive can be adjusted better and in less time than by any combination previously invented.

68. Locomotive Engines; Ross Winans, Baltimore, Maryland.

Claim—The combination of a foot-board, located below the usual level of the platform of the tender and the surface of the grate, with a fire-box and grate adapted to the burning of coal as fuel, whereby the interior of such a fire-box, and the grate thereof, can be more readily reached by the fireman, and his duties be performed with greater expedition, convenience, and effect. Also, the combination of an ash pan, open at its hinder end, with a foot-board located below the grate and the usual level of the platform of the tender, whereby the lower side of the grate, and the space beneath, can be inspected and reached by the fireman while the engine is in motion.

69. Grates for Steam Engines; Ross Winans, Baltimore, Maryland.

Claim—The grate of a locomotive engine, composed of a series of narrow sections, each containing two or more bars and supports therefor, the sections and their supports to permit each section to be rocked independently of the others, by means of a hand lever applied outside of the fire-box. Also, the construction of the series of bars of the grate and the bearers for supporting the same, so that any member of the series may be rocked upon two axes, without contracting the narrowest part of the spaces between it and the adjacent stationary members of the series.

70. Door Bolts; John Woolman, Philadelphia, Pennsylvania.

Claim—The arrangement of the flat or elliptical bolt, contained and moving within suitable straps or castings, with an eccentric motion when operated and moved by means of the handle or lever.

71. Machinery for Bolting, Dusting, and Separating the Ground Material; Joel Woodward, Philadelphia, Pennsylvania.

Claim—1st, The stationary brush or distributor. 2d, The brush, so arranged as to carry the meal or bran to or from the centre, whereby the substance can be secured or brushed as much as desired. 3d, The manner of making any number of separations, or any mode of combining more than two separations in the duster or separator. 4th, The manner of the corresponding bottom or platform below, with sweeps or scrapers to carry the flour to spouts. 5th, The mode of regulating the brushes on the wire or cloth by the bolts or set-screws, and the screw at the bottom of the shaft, and to be used as in the specification.

72. Guiding Reciprocating Scroll Saws; John C. Cline, Assignor to self and Samuel Rhodes, Philadelphia, Pennsylvania.

Claim—The employment of a cap, in combination with a tubular guide.

73. Cutting Device for Reaping and Mowing Machines; Thomas Harding, Assignor to Warden, Brokaw & Child, Springfield, Ohio.

Claim—The arrangement of the end of the sickle bar next the divider of a cutting and clearing section.

74. Straw Cutters; Joseph B. O. Key, Indianapolis, Assignor to self and W. Y. Wiley, Marion Co., Indiana.

Claim—The combination and arrangement of the box, gauge, and knives, upon the drum or wheels.

75. Lamps; Pascal Plant, Assignor to self and Peter Hannay, Washington City, D. C.

Claim—Forcing a current of air through the lower or blue part of the flame, by means of a cap-piece constructed and arranged in relation to the wick tube.

76. Lanterns; Jacob H. Righard, Assignor to self, John Bird, and David Challiner, Birmingham, Penna.

Claim—Making a circular convex projection in the side of the globe of a lantern, cast or moulded in one piece with the globe (which is to be silvered externally as a reflector), the edge of which circular projection is slightly raised from the surrounding surface of the globe, so as to permit of the convenient attachment of a cap or covering to protect the silvered surface of the reflector from injury.

77. Lamps; Robert Steinman, Assignor to self and N. P. Wax, Boston, Massachusetts.

Claim—1st, The arrangement of the elevated reservoir with its filter and passages of communication. 2d, In combination with the reservoir, the passages, and the oil chamber, the bent tube. 3d, In combination with the elevated hot air reservoir, the plate, for the purpose of regulating the temperature of the fat or oil.

78. Grain Separators; Josiah Turner, Sunapee, Assignor to self and Edmund Burke, Newport, N. H.

Claim—The upward, inclined, revolving straw carrier, in combination with the vibratory lattice and the adjustable lattice.

79. Portable Gas Retorts; Davis L. Weatherhead and James T. Henry, Assignor to selves, John M. Smith, and Wm. P. Campbell, Philadelphia, Pennsylvania.

Claim—The exterior horizontal cylinder in combination with the interior horizontal, perforated cylinder,

charged with pumice, when the cylinder is so constructed and arranged that the material from which the gas is to be made shall flow into the annular space between the two cylinders, and the gas, when generated, shall pass through the body of porous material for the purpose of purification.

APRIL 13.

80. AWLS AND TOOLS; Herrick Aiken, Franklin, New Hampshire.

Claim—The form, shape, construction, combination, and arrangement of the set of awls and tools (twenty in number), for the purpose of connecting them with a handle having a receptacle in the large end to contain the said awls and tools, and a socket and gripe secured in the other end to confine and hold the several awls and tools for use, as occasion may require. Also, making the shanks of the awls and tools square, with parallel sides serrated and equal in size. for the purpose of inserting them into a gripe connected with a handle, the shanks being serrated so that the gripe will hold them more firmly for use than if the shanks were made plane without the serrating; and these improvements in awls and tools when used in any kind of socket and gripe for holding and changing them.

81. SEEDING MACHINES; Charles F. Anderson, Charlestown, New Hampshire.

Claim—1st, Actuating the seed slides by means of the shaft operated from the wheel by the spur-wheel. pinion, beveled or made of double oblique form on its outer side, the tube or collar provided with the pin, and the zig-zag groove in the shaft, and the spring. 2d, The latch or catch connected with the slides, and used in connexion with the sliding collar, and the boss or shell on shaft. 3d, The blade or scraper attached to the rod, and actuated when desired, by means of the spindle, shaft, link, and spring. 4th, Raising and lowering the frame of the machine, by means of the eccentrics attached to the axle, in connexion with the straps and clutch.

82. SEWING MACHINES; J. E., J. C., and O. Atwood, Mansfield Centre, Connecticut.

Claim—The arrangement of the needle die, the looper, and the stationary finger, in such relation to each other, for the purpose of extending the loops in a position for the needle to enter them without failure.

83. REAPING AND MOWING MACHINES; Charles Beach, Penn Yan, New York.

Claim—The cutters, and with the separator of a harvesting machine.

84. CHAFF SCREENS FOR WINNOWING MACHINES; Alfred Belchamber, Ripley, Ohio.

Claim—Constructing the screen of sheet metal plates or strips, bent or turned over at one edge and slitted or cut at the opposite edge, so that portions may be bent up; the plates being secured in the frame or between the sides, so as to overlap each other.

85. SAWING MACHINE; John L. Beadle, Marengo, New York.

Claim—The combination, embraced in the manner of raising the table, with the manner of adjusting the cross-head and dogs.

86. DOUBLE-ACTING FORCE PUMPS; Eugene Bellamy, St. Louis, Missouri.

Claim—1st, The division piece, as constructed with top and bottom grooves, fitting on corresponding flanches on the lower chamber, and on the adjustable piece. 2d, The cylinder, as constructed with flanches fitting into grooves in cylinder, as a removable cylinder easily removed, so that another can be replaced in case of breakage.

87. DREDGING MACHINE; E. B. Bishop, Shreveport, Louisiana.

Claim—The combination with the bow of the boat of two spirally flanched shafts, for the purpose of dredging or deepening the chambers of rivers, &c.

88. PLOUGHS; Thomas E. C. Brinly, Simpsonville, Kentucky.

Claim—Grass hook and its plate with relation to the beam and mould-board of the plough.

89. RAILROAD CAR SEAT; David Buzzell, Charlestown, Massachusetts.

Claim—An improved railway chain or combination of a stationary seat, a reversible back, two swinging foot-rests, and mechanism, so connecting the said foot-rests and the reversible back as to enable the foot-rests to be operated by the back. Also, making the reversible back in three parts. Also, the application of the springs to the head-rests, such head-rests being provided with latches.

90. WASHING MACHINE; Henry Cassell, Fredericktown, Ohio.

Claim—The arrangement of the spring pawls and grooves on the shaft, and these arranged with the hooks for elevating the pounders and the spring.

91. TRIMMING THE EDGES OF CIRCULAR BOOT TOPS; Perez C. Crapp, Stoughton, Massachusetts.

Claim—The arrangement of the boot board, the movable frame, the slide, and the boot form, for turning the edges of circular and other shaped boot-tops.

92. MOWING MACHINES; Wm. Crook, New Hope, Pennsylvania.

Claim—Securing the driver's seat to the hinged cutter frame of a mowing machine, in such a position as regards the centre of vibration of said frame, that the weight of the driver may act as a counterbalance, or nearly so, to the cutting apparatus.

93. TRUSS PADS; Wm. F. Daily, Baltimore, Maryland.

Claim—1st, Constructing a hollow truss pad or supporter for hernia, with a series of small perforations in its front plate, in combination with enlarged openings in its back plate, so as to allow of some healing substance being brought in contact with the body, and also ventilation, or a perfect and healthful circulation of air through it, and over or about that part of the body covered by and with which the pad or supporter comes directly and constantly in contact. 2d, Attaching the pad to the main spring of the truss or body strap, by means of the combined agency of a recess or groove in the back of the pad, an oblong slot in the main spring, and a single set-screw, whereby every facility of adjusting the pad speedily by simply operating one screw is afforded, and at the same time a liability of the pad twisting round and rubbing avoided.

94. CORN SHELLERS; A. B. Davis, Philadelphia, Pennsylvania.

Claim—The endless band or endless chain of toothed plates, in combination with the angular barred grating, when the same are arranged for joint operation.

95. BASES FOR ARTIFICIAL TEETH; George Dieffenbach, City of New York.

Claim—Making the base for artificial teeth of a composition of matter in which amber forms the principal ingredient.

96. Railroad Car Brakes; Gideon Dorsch, Schenectady, New York.

Claim—Combining the ends of the levers with an endless chain, when said levers are hung.

97. Cop Tubes; James Eaton, Townsend Harbor, Massachusetts.

Claim—A metallic cop tube having corrugations or grooves upon its surface, formed by corresponding knife edges upon the face of the die in which the tube is made.

98. Harvesters; D. W. Entrikin and Lewis H. Davis, West Chester, Pennsylvania.

Claim—1st, The combination of shaft, curved attachment. lever, pulley, tongue, and ratchet. 2d, The combination of the slotted piece upon the main axle with the crank working in said slot. 3d, The combination of the rollers above and below the tongue with the vertical plates.

99. Cutting Device for Harvesters; D. W. Entrikin and Lewis H. Davis, West Chester, Pennsylvania.

Claim—In combination with the roughness upon the surface of cutter bar and cutters, arching the finger and extending it back upon the bar, and the hollowing out of the finger under the cutter bar.

100. Hay Knives; John Fasig, Jackson, Ohio.

Claim—The angular knife, it being attached to the shank.

101. Spring Bed Bottom; Elbridge Foster, Hartford, Connecticut.

Claim—The arrangement of the side and end springs, that is, so that while one set of springs shall be attached to the middle parts of each to the frame, and be made to bear at their ends against the bars, the other set shall be attached at their middle parts to the bars, and be made to bear at their ends on the frame.

102. Water and Fire-proof Safe; John T. Garlick, City of New York.

Claim—1st, Combining a series of air cells or spaces with a filling of non-conducting material in a safe having a door or doors closing water-tight, to render the same sufficiently buoyant to float in the water, and also to resist the action of heat and prevent the heat communicating to the articles stored in the safe. 2d, The combination of the safe with the the loose bed or button piece.

103. Seed Drills; John Harris, Shippensburgh, Pennsylvania.

Claim—Having the spring bar attached fast to the upper part of main relief connecting bar of the drill tooth by one end, loosely connected at its other end to the upper end of the drill tooth, by means of a curved hook on the tooth and a slot in itself.

104. Railroad Car Couplings; Albert Hebbard, Galesburgh, Illinois.

Claim—The combination of the round or oval ring or clevis attached to the bumper, the hook of the bumper the same to act as a self-coupling, the latch, and the clutches, so as to enable any one to use the bumper and ring as a self-coupling.

105. Alarm Lock; Horace L. Hervey, Windsor, Connecticut.

Claim—1st, The pin-wheel. 2d, The slotted dial, either plane, pointed, or corrugated on its face, in combination with dial holder. 3d, The piece on the rear end of knob shaft, and working on the face of dial, or through the slot on dial, for operating the pin-wheel. 4th, The dial, illuminated or not, and index hand, when arranged and operating in connexion with inside dial. 5th, The manner of changing the lock into a common spring lock, by means of pin.

106. Chronometric Lock; A. Holbrook, Milford, Massachusetts.

Claim—1st, The use in the construction of automatic and chronometric locks of jointed release levers, so arranged that their action when released shall be from the time work, and so that the releasing of either lever from its rest or the time work shall release one end of the crescent. 2d, The retaining of release levers while the lock remains locked upon fixed or adjustable rests, which shall receive all pressure necessary to insure the action of the levers when released by the time work. 3d, The use of a crescent, so arranged that the releasing of either end of it shall also release the unlocking spring or springs unlocking the lock. 4th. The use of a spiral grooved cylinder (operated by time work,) with the base on bottom of the spiral grooves full and entire, without notch or cavity. 5th, The use of a hollow cylinder locking bolt, revolving loosely in the bed when locked. 6th, The adjusting springs. 7th, The arrangement of a guide, or its equivalent, with its guides and unlocking springs between the unlocking bolts. 8th, The spiral spring bolt, operated from the outside of the lock plate, for the purpose of retaining the locking spring compressed till closing the door.

107. Wheelwrights' Machine; Samuel Holl, Reading, Pennsylvania.

Claim—The sliding feed rests, or anything essentially the same, in combination with the devices of the open ended shaft, bevel gearing check screw, and nuts; also, feed screw, shaft, spur gear, and guide. Also, the combination and arrangement of the device for cutting tenons and boxing hubs, without removing the wheel from the machine.

108. Water Filterers; A. Janinet, Florissant, Missouri.

Claim—Combining one or more double chambered preparatory separating vessels, with one or more filtering vessels, and furnishing both sets of vessels with puppet or other valves, and operating said valves by means of tilting troughs through the agency of the weight of the filtered water.

109. Machine for Excavating and Washing Gold; S. Johnson, City of New York.

Claim—The chain and buckets in their peculiar form of construction and method of operation, in combination with the pump.

110. Bee-hives; Kimball P. Kidder, Burlington, Vermont.

Claim—The particular construction of the hive, so that the smaller portion may fit within the larger portion, and leave a dead air space between them, or raised up and supported on the division or partition boards to form two hives. Also, in combination with the hive, the device for regulating or entirely cutting off the ingress or egress openings, said device being susceptible of four distinct adjustments.

111. Bonnet Frames; W. E. Kidd, City of New York.

Claim—Making ladies' bonnet frames of two thicknesses of cape lace.

112. Throttle Valve; T. S. La France, Elmira, New York.

Claim—The series of chambers in the valve seat, in combination with corresponding chambers or passages in the valve shell, and the bracing and binding partitions.

113. Mode of Constructing Trunk Handles; S. Lagouritz, Newark, New Jersey.

Claim—The thin leather shell, prepared, packed, and stitched.

114. Straw Cutters; John R. Landis, Lancaster, Pennsylvania.

Claim—A yielding bed or bottom in the feeding trough or box connected to, and depressed by, the lower feeding roller as it is forced down by the material fed into the machine. And in combination with the above, the rotary cutting apparatus, arranged to receive the fodder cut, and cut it still finer.

115. Track Clearers for Mowing Machines; A. Marcellus, Amsterdam, New York.

Claim—Operating the plate or board from the driving wheel.

116. Door Fastener; George W. McGill, Buffalo, New York.

Claim—1st, The formation of blade with its peculiar connexion with blade. 2d, The use of the blade, and operating in connexion with screw, and blade, and screw.

117. Grain and Grass Harvesters; H. Marcellus, Amsterdam, New York.

Claim—The V shaped ledges secured in any proper way between the fingers at their back parts, in combination with the oblique sides at the back parts of the cutter teeth.

118. Machine for Hoisting and Dumping Coal; George Martz, Pottsville, Pennsylvania.

Claim—1st, The employment, in combination with the car and dumping chute, of the peculiar arrangement of mechanism, consisting of the sliding gate, pivoted platform, confining catches, trip bar, tilting or dumping stop. 2d, The employment of the tilting or dumping stop bar, whether yielding or stationary, above the front of the platform. 3d, Having the sections of the railroad attached to the platform, so that they may rise and come in contact with the wheels of the car, and cause the car to assume a proper lifting position, and also serve for lifting the car, and likewise for holding it from forward or backward play while tilted or dumped.

119. Bar for Securing Bank Vaults; Wm. Maurer, City of New York.

Claim—The arrangement and use of a revolving hinge plate, to which the bar for securing and strengthening doors is attached.

120. Illuminating Iron Rolling Shutters; James McIntyre, City of New York.

Claim—The construction of a rolling shutter with its slats of iron and glass combined to obtain the characteristics.

121. Furnaces; James McCracken, Bloomfield, New York.

Claim—The employment of hollow grate bars in combination with a closed ash pit, so that the air which passes through the said grate bars shall be discharged into the ash pit, and thence pass up between the said grate bars to supply the blast or draft to the fire on the grate bars. Also, the use of tubular bearers for supplying heated air to the inflammable gases at or near the fire bridge, in connexion with a shield-plate, and interposed between the fire and boiler, or other body to be heated, to maintain the inflammable gasos at a high temperature until after they are supplied with heated air for their ignition.

122. Stencil Pallet; J. H. Merriam, Boston, Massachusetts.

Claim—A stencil marker's pallet or pot.

123. Conduit Joint for Gas Pipe; Charles Monson, New Haven, Connecticut.

Claim—The new mode of connecting two leading tubes, viz: by a flexible tube and a joint, which will not only allow one tube to be moved into one or more angular positions with respect to the other tube, but so connect the two leading tubes as to relieve the flexible tube from injurious, longitudinal, or tensile strain.

124. Connecting Rigidly the end of Metallic Beams; Samuel Nowlan, City of New York.

Claim—Forming a rigid joint of two metal beams, by pouring molten metal between the tongue of one beam and the mortise of the other, when the sides of the tongue, which have a latch projection, fit on to the sides of a similar shaped mortise and socket, and when the opposite sides of both the tongue and the mortise are corrugated and leave a space between themselves, into which the molten metal is to be poured.

125. Cords for Skirts; D. Perry, Paterson, New Jersey; ante-dated October 13, 1857.

Claim—The peculiar hoop-like manufacture of cordage—that is to say, the untwisted fibrous or filamentous core, when compressed and lapped or wound while in that state.

126. Giving Adhesion to Driving-wheels of Steam Vehicles, Ploughs, &c.; John T. Price, Rockville, Ind.

Claim—The arrangement of spurs on driving-wheel for steam plough or land carriage, so that said spurs do not interfere with the rolling of said wheel, unless it should slip on the ground, and then when it slips said spurs (aided by the diagonal corrugations tending to force the dirt against them,) to take effect and prevent it.

127 Process of Extracting Fat Oils from Seeds; John Preston, Dorchester, Massachusetts.

Claim—The employment of either molasses or a sugar syrup.

128. Fog-Bells; A. C. Rand and R. R. Johnson. Buffalo, New York.

Claim—The arrangement of mechanism No. 1, and mechanism No. 2 (or equivalents,) relatively to each other.

129. Snow Ploughs; Samuel Richards, Philadelphia, Pennsylvania.

Claim—The snow plough having vertical planes made adjustable at the same time both up and down the inclined plane, and from side to side, whereby it is rendered equally effective in passing from light snow to deep snow, and in throwing the snow to either side of the track at pleasure.

130. Tightening the Spokes and Felloes of Carriage Wheels; B. A. Rogers, Shubuta, Mississippi.

Claim—The combination in a wheel of the annular chamber, spoke sockets communicating with said chamber, expanding packing ring, taper axle box, and extended spokes.

131. Straw Cutters; E. P. Russell, Manlius, New York.

Claim—The arrangement of knife and feed rollers, when attached for operation and arranged relatively with the feed-box.

132. Seed Planters; Thomas Russell, Waldoboro', Maine.

Claim—Arranging the arm of the rocker shaft, so as to extend and operate in the space between the wheels, in order that such arm may serve to clear the said space between the wheels from earth which may adhere or be taken up therein. Also, in connexion with a hopper made removable from the frame, applying the movable brush to the dropper or valve, by means of an arm extending down from the brush shaft and into the dropper.

133. Wrench; E. S. Scripture, New Haven, Connecticut.

Claim—The employment within the pawl of a screw-rod.

134. CHAIN SHACKLE; Joseph Snelling, East Boston, Massachusetts.

Claim—The improved connecting shackle or link as made in two parts, and with one of them formed in one piece as a double hook, and with a space between its extremities, and with tenons, and its other part constructed so as to extend into and fill the said space, and lap over the hooks and receive these tenons.

135. COOKING STOVES; James Spear, Philadelphia, Pennsylvania.

Claim—The hollow centre-piece, when connected with the hot air tube.

136. HORSE SHOE MACHINE; George Stiles, Jr., and S. Kneass, Philadelphia, Pennsylvania.

Claim—1st, The employment of the stationary former, in connexion with the reciprocating levers and with the fixed cam. 2d, The employment of the moving swager, fixed swager, for forming and swaging the shoe while on the former, and inclosed at the side in a hollow moving die-box. 3d, The employment of the hollow box plunger in connexion with the former, for creasing and punching the shoe at the same time that the outer edge is finished by the hollow die-box.

137. RAKING ATTACHMENT TO HARVESTERS; Oren Stoddard, Busti, New York.

Claim—1st, The balance frame connected with fingers or arms, or other raking device, in such a manner that the cut grain, by its own gravity, in connexion with the weight or counterpois of the frame, will be made to actuate the raking device, so that the gavels will be discharged from the frame of equal weight, however variable the crop being cut may be. 2d, The peculiar arrangement of the balance frame shaft with clutch, attached pulleys on shaft, cords, fingers or arms, and bar. 3d, The registering device formed of the dial and index, operated automatically from the raking.

138. GAS BURNERS; Wm. Tallman, Cincinnati, Ohio.

Claim—The construction and arrangement of the disk, fixed concentrically within the burner, so as to leave around it a contracted annular passage.

139. SODA FOUNTAINS; C. D. Van Allen and S. Avery, Baldwinsville, New York.

Claim—The apparatus, that is to say, the combination of the reservoirs to contain, the one an acid, the other an alkali, in separated solution pipes, valve, pump champer, elastic cover, aperture, valve, valve cap, pipe, and generator, when the several parts are constructed and relatively arranged with respect to each other.

140. REVOLVING FIRE ARM; Rollin White, Hartford, Connecticut.

Claim—1st, The enlargement of the chamber in the rotating cylinder, or in a portion thereof in a rearward direction, when such cylinder or portion thereof is detached from the breech, and thereby rendered capable by such enlargement of being driven forward into contact with the stationary barrel, for the purpose of preventing windage. 2d, Making the detached breech of the rotating chambered cylinder rotate with the said cylinder. 3d, Constructing the breech of the revolving cylinder with a recess in its face at the back of each chamber, and a notch in its periphery meeting the said recess, so that the hammer swinging in the manner most common to fire arms may strike into the chamber and cut or tear, and thereby explode the cartridge. 4th, The fitting of the hammer to close that portion of the breech which is left open by the notches.

141. LOCOMOTIVE ENGINES; Ross Winans, Baltimore, Maryland.

Claim—The arrangement of the house or position for the engine-man between the fire-box and the forward end of the boiler, to aid in properly distributing the weight upon the wheels in a locomotive engine, with a fire-box of the large size necessary for the economical burning of coal as fuel, and incidentally, to secure other advantages.

142. ROLLING MILLS; John A. Bailey, Boston, Massachusetts, Assignor to James Horner and James Ludlum, City of New York.

Claim—The application of eccentrics to the journals of rolling mill rollers.

143. PRESERVING JARS; J. Borden, Assignor to D. Potter and F. L. Bodine, Bridgeton, New Jersey.

Claim—A preserving jar in which the cup or groove for holding the cement is formed on the exterior from the wall of the jar.

144. OVENS; J. S Browne, Washington City, D. C., Assignor to self and Joseph Kent, Baltimore, Maryland.

Claim—Introducing the draft air in a thin sheet around the top of the oven, whereby the heat which otherwise would radiate from the outer surface of the oven is employed for improving the combustion in the furnace or heater. Also, the strips or plates arranged in the inclosed air spaces, for the purpose of confining the heated air closely to or near the inner case of the oven. Also, the plate.

145. WATCH CASES; Elihu Bliss, Assignor to Baldwin & Co., Newark, New Jersey.

Claim—1st, In arranging the pendant so as to form one of the centres on which the body of the watch turns, and by which it is permanently attached to the outer case, whereby the pendant itself forms a handle to reverse the body of the watch on the outer case 2d, Arranging the case holding the works of the watch within a secondary ring pivoted to the outer case, so that the body of the watch can be turned in a plane parallel to its face, in order to change the position of the figures on the dial plate, when the watch is reversed in the outer case. 3d, The arrangement of the push piece and pin, so as to act on the spring-holding catch of the closed brizzle of the outer case when on either side of the pendant.

146 ROTARY STEAM ENGINES; Levi Matthews, Assignor to self and J. R. Andrews, Antrim, Ohio.

Claim—Hinging the circular piston at its centre to the outside driving ring, by means of a rigid arm or piece projecting from said ring into the annular steam channel of the cylinder.

147. MACHINE FOR ROLLING AND CUTTING DOUGH; Isaac S. Schuyler, Assignor to J. McCollum, City of N. Y.

Claim—1st, The removable guides, when used in combination with the sides of a reciprocating cutter, and operating for the purpose of releasing and securing the cutter. 2d, The perforated discharging plate, either with or without yielding resistance, in combination with the reciprocating cutter, when made adjustable.

148. STEAM GENERATORS; George Scott, Assignor to Scott, Todd & Co, Philadelphia, Pennsylvania.

Claim—The employment of a rotating tubular coil, one end of which is connected with any suitable apparatus for forcing in water, &c., and the other with a suitable vessel to receive the steam generated in the said coil, when this is combined with a furnace so arranged that in the rotation every part of the circumference of the coil will in succession pass over the fire.

149. SIGNS, DOOR-PLATES, &c.; John T. Wellman, Assignor to Charles O. Thompson, Lowell, Massachusetts.

Claim—The new manufacture of door-plates or signs described, to wit: a transparent plate having a backing containing the name or device affixed to said backing, and the backing affixed to the plate.

150. Machine for Manufacturing Splints for Brooms; John W. Wheeler, Assignor to self and C. D. Williams, Cleveland, Ohio.

Claim—The grooved cylinders, the periphery of whose tongues or ribs pass each other, the edges being in contact and acting like revolving shears, when arranged in combination with the delivering combs.

151. Watch Cases; John F. Watson, Assignor to James Adams, St. John's Square, Clerkenwell, Middlesex Co., England, Assignor to Bigelow Brothers & Kennard, and Palmers & Batchelders, Boston, Mass., Assignors to Baldwin & Co., Newark, New Jersey; patented in England, June 16, 1857.

Claim—1st, Attaching the pendant to the outer instead of the inner case, as heretofore done. 2d, The arrangement of the pivots on which the watch turns, or the springs for holding the body of the watch to the case, in relation to the figures on the dial plate and to the pendant on the outer case.

152. Burglars' Alarm; H. Hersh, B. Bauman, and H. H. Locker, Lancaster, Pennsylvania.

Claim—The shape and construction of the levers. with their beams and weights, together with the sliding pins, as operating through the levers against the spring.

153. Preparing Manure Beds; Charles F. Spieker, M. D., City of New York; patented in England, August 19, 1857.

Claim—The use of the peculiar process by which I produce, condense, and fix ammonia, and change it into salts of ammonia in ammonia beds made of aluminous earth, silicates of alumina, or the oxides of iron, sheltered from the rain and excessive temperature, and charged with diluted acids or weak solutions of such salts for the acid of which ammonia has a greater affinity than the base with which it was combined.

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154. Horse Hay Rakes; Nelson E. Allen, Trenton, Wisconsin.

Claim—So connecting a lever which actuates the dog with a clutch that gears with the driving-wheel, as that one operation throws out the dog, and throws in the clutch, and vice-versa, which makes a positive and compulsory rotation of the rake.

155. Gearing for Horse Power; Cyrus Avery, Tunkhannock, Pennsylvania.

Claim—1st, Forming the main wheel with a wide periphery, cast whole or in sections, so that any desired number of series of intermediate wheels may work within it, one series above another, and each series to gear into the main wheel, thus enabling me, by slipping on or slipping off one or more series of intermediate wheels, to produce very low, very high, or medium velocity. 2d, The method by which the main wheel is kept in position, to wit: by means of a thimble attached to the centre of the bed-plate, in connexion with the flanches upon the lower intermediate wheels, and by the flanch upon the outside of the main wheel in connexion with the circle around and above it, and by the pivot at the top of the main shaft. 3d. The method by which any desired velocity is obtained, namely, by removing or adding one or more series of intermediate wheels.

156. Life Boat; Leverett Ball, Auburn, New York.

Claim—The doors with the life boat, for the purpose of preserving the lives of shipwrecked passengers.

157. Dressing Saws; Job Batchelor, Camden, New Jersey.

Claim—The horizontal disk file, and its connexion and combination with the movable parts of the machine.

158. Sewing Machines; Charles Frederick Bosworth, Petersham, Massachusetts.

Claim—The jointed rocking feed hand, so as to play freely between and upon two fulcra, when operating from beneath the sewing table, in combination with the pressure pad above said table. Also, regulating the angle of vibration of the feed hand, by means of two stops, one of which is so adjustable as to allow the fulcrum upon which the said feed hand moves to be raised or lowered, thereby diminishing or increasing the feed at pleasure.

159. Runners of Sleds; Silas Bullard, Hartland, Michigan.

Claim—Constructing the rear runners of sleighs in separate frames, each frame being hung by link joints to the cross-bar, so as to admit of a fore and aft rising and pitching movement in each runner, which shall be independent of the movement of the opposite runner. Also, the construction of the tie-beam, so contrived as to hold the separate forward runner frames at the proper distance apart, by the fastening bolts near its ends, and at the same time to allow the independent rising and pitching movement in each runner, by making the mortise holes in it so large as to admit the bars to play loosely therein, so as to allow of a slight rolling motion on the axis, or whenever the runners rise or pitch from the irregularities of the ground.

160. Compound Air-pump and Gasometer; Samuel Chichester, Poughkeepsie, New York.

Claim—A machine composed of a reservoir and two pumps, whose pistons having their weight proportioned, are combined with a shaft, to which a power of a spring or weight or their constant first mover is applied, by means of a cord or chain, connecting them with a loose pulley on the said shaft, a wheel fast upon the said shaft, a stop for acting on the said wheel to stop the shaft, and a proper contrivance for engaging the loose pulley with, and disengaging it from, the shaft.

161. Sharpening Device for Rotary Cutters; Edward Conroy, Boston, Massachusetts.

Claim—The sharpening device.

162. Cross-cut Sawing Machine; Richard M. Crosby, Indianapolis, Indiana.

Claim—The combination of the rocking lever, spring, and weight, with the saw frame.

163. Cooling and Drying Meal; John Deuchfield, Oswego, New York.

Claim—The arrangement and combination of the chests, shafts, elevators, fan, and spout.

164. Platform Scales; Charles H. Earle, Green Bay, Wisconsin.

Claim—1st, Supporting the platform by plates, and connecting the platform with the beam, by means of the bent lever, rod, and arm, or an equivalent device. 2d, The auxiliary weight formed of the chain, in connexion with the cup.

165. Driving-wheels of Locomotive Engines; John F. Elliott, New Haven, Connecticut.

Claim—The combination with the legs of the feet jointed to the said legs and connected together by chains.

166. Portable Invalid Bedsteads; Zebulon C. Favor, Chicago, Illinois.

Claim—The arrangement in an invalid cot bedstead, embracing the following several features, to wit: two

slotted straps, two stop pins, two loops, turning thimble eyes, punctured strips, beveled rails, obliquely set pivoted legs, and turning thimble stop catches, and for the purpose of producing an improved new article of manufacture

167. Burnisher; Charles Frampton, Brooklyn, New York.

Claim—A burnisher for spinning screws.

168. Life-preserving Bucket Raft; Charles French, Jersey City, New Jersey.

Claim—Furnishing buckets with encircling gaskets or grummets, so that two or more of such buckets may be combined to constitute a float or raft.

169. Field-Fence; Benedict Gabriel, Elmira, New York.

Claim—Constructing the post halves with points having their inner edges wedging, so as to force said points further apart in the act of driving the post into the ground, arranged in combination with the step.

170. Treatment of Sulphureted Ores; Isaac Gattman, Philadelphia, Pennsylvania.

Claim—The use of sulphuric acid in connexion with the hydrate, carbonate, or sulphate of potash or soda, or with any compound thereof, in the mode of working the native metallic sulphurets.

171. Rails for Street Railroads; John B. Henck, Boston, Massachusetts.

Claim—In a cast iron rail, the combination of the supporting lap and dove-tailed dowel, the said dove-tail being cast on the said lap, whereby the said rails are rigidly locked, and prevented from rising or falling, or moving in either lateral direction.

172. Clenching Horse Shoe Nails; James Houck, Green Castle, Indiana.

Claim—The use of the post, when constructed with the cap and band.

173. Runners of Sleds; John Hoyt, Fishkill, New York.

Claim—1st, The combination of the headed noddle pin with the dog-joints and the frame bob. 2d, The combination of the noddle pin with the jointed reach. 3d, The attachment of the rear bob to the double-cranked axle, and to the body of the sleigh.

174. Steam Governor; R. D. Jacobus, Newark, New Jersey.

Claim—Using a distinct motive power from the main engine, with the motive power of the main engine to operate a governor, in combination with machinery.

175. Centre-Boards of Navigable Vessels; Benjamin Joline, Westfield, New York.

Claim—Suspending the front end of the centre-board within its trunk, by means of the bridle, in combination with the bolt, slot, or their equivalents, to serve as a guide.

176. Operating Blacksmiths' Hammers; James W. Kerr, Rochester, New York.

Claim—The combination and arrangement of the eccentric with the slotted and reciprocating gate and bellows, whereby the required motions for successfully operating the bellows are obtained by the revolutions of the balance wheel. Also, the combined operation of the wheel with cam or cams, lever bar, hammer lever, hammer, and spring, whereby the power may be reciprocatingly employed between the action of the bellows and trip-hammer, so that the power released from one is expended on the other, and vice versa.

177. Umbrellas; Henry Kurth, Brooklyn, New York.

Claim—Making the rib by coiling the wire into loops, which serve like ordinary holes in the rib for the joints, and attaching the stretcher to the middle loop without the interposition of intermediate links.

178. Harvesters; H. Marcellus, Amsterdam, New York.

Claim—Connecting the draft bars of the draft pole to the pole plank at a point intermediate between its caster-wheel, at the front end of the pole plank, and the point of connexion of the pole plank with the machine.

179. Combined Coal Scuttle and Ash Shifter; A. McNeill, Washington City, D. C.

Claim—Constructing a coal scuttle provided with the extended scoop-shaped piece, slide, screen, and cover.

180. Potato Planter; F. S. McWhorter, Smyrna, Delaware.

Claim—The employment of a transverse hopper having an inclined bottom, and arranged on one side of the endless chain conveyor, in combination with a longitudinal guide and retaining box, which has its rear portion inclined and its front portion horizontal, and a brush which brushes off any surplus pieces of potatoes which may collect in the cells or chambers of the endless conveyor.

181. Domestic Mangle; Samuel Nowlan, City of New York.

Claim—The mechanism of a mangle, constructed and arranged in relation and in combination with parts of any suitable articles of furniture.

182. Corn Shellers; E. Parker, Baltimore, Maryland.

Claim—The combination of the cylinder, the spring back, and rollers, when they are constructed and arranged with respect to each other.

183. Securing Tires to Railroad Car Wheels; L. Pusey, Philadelphia, Pennsylvania.

Claim—The slotted ring, forming a series of openings to admit corresponding parts of the tire passing through said openings.

184. Portable Field-Fence; L. S. Robison, Gypsum, New York.

Claim—My method of constructing a fence which will be portable and easily put up, by means of the panels, with the cross-bars and the blocks on the end of the projecting horizontal bars.

185. Operating Sewing Machines; P. J. Steer, Washington City, D. C.

Claim—The arrangement for starting sewing machines always in a right direction, and to prevent backward motion with the knee and foot of the operator, and without using the hand for that purpose.

186. Railroad Rails; E. W. Stephens and R. Jenkins, Covington, Kentucky.

Claim—Constructing a tubular rail when the walls are welded, forced, or pressed together from the base of the rail up (or so near together, that when the weight is placed on the rail, in using it, the walls will force together), combined with the walls made concaving on their outside, from near the top of the rail down a short distance below where they are made to meet, for the purpose of making the walls brace inwards, with which combined structure and form of rail we can make a stronger one with the same quantity of metal.

187. Catch Latch for Farm Gates; J. Summers, Raleigh, Virginia.

Claim—The peculiar formed spring plate, in combination with the spring bolt, as an attachment for farm gates.

188. Hollow Cast Iron Cooking Utensils; Adam V. Van Hoevenbergh, Southside, New York.

Claim—A new and improved article of manufacture, to wit: hollow cast iron cooking utensils, kettles, gridles, &c., having the interior surface which comes in contact with the cooking material polished by any of the usual processes for polishing metal.

189. Bit-holder; David H. Whitmore, Worcester, Massachusetts.

Claim—The holder with its cam.

190. Metallic Shoes for the Braces of Truss Girders; T. B. White, New Brighton, Pennsylvania.

Claim—The combination with the diagonal braces in a truss girder of the peculiarly constructed metal male and female shoes and wedges, for the purpose of setting up the braces to give camber to or raise the girder.

191. Quartz Mills; L. W. Williams, Nevada City, California.

Claim—Constructing the inside bottom of circular batteries (in which quartz is to be crushed), of a series of inclined planes or curved surfaces commencing at any desired base, and produced to any required height, and over and in contact with which stampers or wheels are made to revolve, and by their revolution over such inclines are alternately raised and let fall.

192. Curtain Fixtures; Thomas K. Work, Hartford, Connecticut.

Claim—1st, The arrangement consisting of rollers, bar, pin, yoke, case, endless band, and roller. 2d, The plates, constructed with projecting ears, so that the plates may be attached either to the front or side of the window casing as may be desired.

193. Seed Planting Hoes; Samuel Woodruff, Sparta, New Jersey.

Claim—The box provided with the valve and plunger attached to the hoe, and used in connexion with the sack or receptacle placed on the operator, and communicating with the box by means of the flexible tube.

194. Lime-Kilns; B. Zwart, Keokuck, Iowa.

Claim—The construction of a division wall, in combination with the adjoining fire places and walls, to secure the even burning of both sides when desired. Also, the combination of the solid spherical triangle in connexion with the form of the canals, from R down to K. Also, the particular construction of the hot air conductors, in combination with the division wall, and in combination with the draft flues, to procure the horizontal draft of hot air, and make the same serviceable, so as to act direct on the limestone.

195. Machine for Making Wooden Dowel Pins; Amos H. Boyd, Assignor to Samuel F. Chase, Saco. Maine.

Claim—1st, The slotted clamp carriage or bed-piece, in combination with a gang of two or more circular saws for splitting or cutting off wood. 2d, The arrangement and adaptation of said circular cutters, in combination with said clamp carriages and circular saws.

196. Reaping Machines; John W. Brokaw, Assignor to Warder, Brokaw & Child, Springfield, Ohio.

Claim—The combination of an auxiliary platform, with the platform for the reception of the grain as it is cut, when arranged, constructed, and operated in a space between the latter and the driving-wheel.

197. Smoothing and Polishing Iron; Francis A. Cannon, Assignor to John Phillips, Brooklyn, New York.

Claim—The application and arrangement of rollers or cylinders to smoothing and polishing irons, by which a high degree of polish is imparted to linen and other fabrics, with the least expenditure of muscular power.

198. Meat Cutters; Pierre Demeure, Brooklyn, New York, Assignor to Charles Chepy, City of New York.

Claim—1st, The opening in the cover placed near the front part of said cover. 2d, The arrangement of the hinged cover and latches, in connexion with the removable basin. 3d, The arrangement of the cutters acting through slots in the cover, in opposite directions on the meat, &c., to be cut, as the same is presented by the revolving basin.

199. Manufacture of Leather, Paste-Board, and Paper; A. N. Mathieu, Paris, France, Assignor to M. J. A. Guiet, City of New York; patented in France, April 13, 1855.

Claim—Manufacturing paste-board or paper of leather shavings, by simply washing, grinding, and mixing the same with vegetable fibres, without the addition of other manipulation or material, by which I make a cheap and merchantable article, when heretofore the process was too expensive for its profitable use.

200. Method of Ventilating Railroad Cars; Calvin Pepper, Assignor to Nelson R. Scovel, Albany, N. Y.

Claim—The manner of purifying the air as it enters the cars, by passing the same through the pnennometer composed of the tubes in the water chamber.

201. Casting Car Wheels; Robert Poole, Assignor to self and German H. Hunt, Baltimore, Maryland.

Claim—1st, The base of the flask made in sections, so that the centre one may be removed without disturbing the remaining one. Also, the sectional cope, so made that either section may be removed without disturbing the other one. Also, in combination with the sectional base and cope, the central member of the flask with a lining of some non-conducting material.

202. Horse Shoe Machine; Elwin Shaw, Providence, Rhode Island, and C. Carpenter, Jr., Pawtucket, Mass., Assignors to selves and G. B. Justram, Providence, Rhode Island.

Claim—Varying the point at which the pressure for narrowing and thickening the heel commences, by moving the mould in or out.

203. Corn Planters; George Taylor, Richmond, Assignor to self and John W. Free, Laporte, Indiana.

Claim—1st, The combination of parts, shaft, and wheel, with slide, for the purpose of correcting the machine, and making it plant in line with work already done. 2d, The weighted spring arms for correcting the machine, when said spring arms are so situated as to mark midway between the rows of planting.

204. Churn; James Macnish, Berlin, Wisconsin.

Claim—The combination of a central spiral, flanched or winged agitating shaft, with a series of encircling expressing rollers, a portion of which have a direct motion in one direction, while the others have an indirect motion in an opposite direction.

APRIL 27.

205 REVOLVING RETORTS FOR DISTILLING COAL, &c.; David Alter and Samuel A. Hill, Freeport, Penna

Claim—The use of retorts so constructed, as to revolve continuously on their axis during the process of distillation.

206. LOCK; Ludwig Baier, Cincinnati, Ohio.

Claim—The combined arrangement of the tumblers and guard plate piece, with the bolt.

207. INKSTANDS; John M. Batchelder, Cambridge, Massachusetts.

Claim—An inkstand having a central dipping cup with an exterior screw, by which it is raised and depressed, causing a corresponding rise and fall of the ink in the stand as the plunger enters and leaves it—the combined screw, dipping cup, and plunger, being made in one piece.

208. MILL-STONE DRESS; Franklin Bellinger, Lockport, New York.

Claim—The furrows, cut into the stones tangentially with the eye, and gradually diminishing both in depth and width from the eye to the periphery, where they terminate in points, the space between the circle and eye of the runner being inclined or made open.

209. RICE HULLERS; Horatio N. Black, Philadelphia, Pennsylvania.

Claim—The employment of an elastic covering for forming one of the rubbers of a huller, composed of alternate layers of cloth and vulcanized rubber, the outer surface of which is formed by incorporating with the vulcanized rubber, emery, or other hard and gritty material, when the same is combined with an adjacent rubber of metal, or other hard unyielding material, with a grinding or breaking surface.

210. FURNITURE CASTERS; Henry D. Blake, New Hartford Centre, Connecticut.

Claim—The arrangement of the several parts of the caster.

211. APPARATUS FOR BEATING EGGS, CHURNING, AND THE LIKE PROCESSES; Wm. Borrman, Cincinnati, Ohio.

Claim—1st, The semispherical open work dasher, in combination with a bowl of corresponding form and size. 2d, In connexion with the above, the inverted cup, adapted to receive the egg or other matter as it becomes sufficiently beaten, and retain it beyond the reach of the dasher.

212. ATTACHING SHAFTS TO VEHICLES; John A. Boyce, Monroe, New York.

Claim—Attaching the shafts or poles to the axles of carriages, or other vehicles, by means of the combination of fastenings, viz: the bolt connexion and the projections on the pieces made to bear against the depressions in the double concave ring.

213. APPARATUS FOR EVAPORATING BRINE; Dennis Brigham, City of New York.

Claim—The arrangement of the steam heaters, with the boiler, pans, and cistern, so that the pans and cistern may be heated by one steam pipe.

214. MOWING MACHINES; Thomas D. Burrall, Geneva, New York.

Claim—The auxiliary frame and caster wheel, forming a carriage to which the animals are attached by a loose pole, when combined with the sector, lever, and standard, whereby the forward part of the main frame and the cutter bar are elevated or depressed on a line between the caster wheel and main wheel.

215. MACHINE FOR CUTTING SCREWS; Philip Chapin, Baltimore, Maryland.

Claim—1st, The employment of a cutter carriage with two branches, one of which is movable, and so constructed, mounted, and arranged as to embrace the prepared material and the driving screw at the same time and by the same movement. 2d, The combination of the carriage, the driving screw and the adjustable gear, for the purpose of cutting threads in wooden screws. 3d, The employment of the hollow binders, for the purpose of securing cutters in proper positions for the forming of wooden screws.

216. TURNING DOWN THE EDGES OF ELASTIC CLOTH; Gilbert H. Chesbro', Stafford, Connecticut.

Claim—The plate, constructed and operating for the purpose of turning the edges of the faced side of the cloth over as it passes between the compressing cylinders.

217. STRAW AND STALK CUTTERS; Peter S. Clinger and Cyrus Cremer, Conestoga Centre, Pennsylvania.

Claim—The revolving toothed cylinder armed with knives and spikes, in combination with the stationary knives and toothed concave, constructed to operate conjointly.

218. CARD PRINTING PRESS; Wm. W. Clarkson, Baltimore, Maryland.

Claim—1st, The combination by the peculiar arrangement of mechanism of the slide, which feeds the cards singly from the card-box; the bed-plate which supports and carries the impression form, and the inking roller which inks said form. 2d, The combination of the vibrating slide, which feeds the cards singly, with the groove guide, which receives, and retains, the cards below the platen and directly above the impression form while being printed. 3d, The peculiar manner of adapting the card-box for cards of different widths, lengths, and thicknesses, to wit: by having its side, front, and back boards or strips adjustable laterally, perpendicularly, and longitudinally, by means of slots and set-screws.

219. FROGS FOR RAILROAD CROSSINGS; Eli T. Conner, Borough of East Mauch Chunk, Pennsylvania.

Claim—1st, The construction of a frog, with a central part raised above and projecting over the bar and also the ledges, in combination with the frog, for the purpose of securing to the frog, and making use of, in combination with the frog, any ordinary rail used upon railroads. 2d, The wedge and dove-tail-shaped cavity in the central part, in combination for the purpose of securing the point. 3d, The cavities or depressions, and in the base, in combination as aforesaid. 4th, The wedge and dove-tail-shaped point, to fill the cavity in the central part, so constructed that the same can be removed for repairs and renewals.

220. BREECH-LOADING FIRE ARM; Calvin Cox, Coxville, North Carolina.

Claim—The arrangement of a blade or cutter in the rear part of the breech of the fire arm, for use in combination with a bored sliding cartridge carrier and cartridge magazine.

221. RAT TRAP; Wm. H. Cox, Virden, Illinois.

Claim—The sliding case placed on the bed-piece, which is provided with end pieces and partitions, the case being operated by means of the spring, shaft, cross-arm, and arbor, connected with proper triggers.

222. MACHINE FOR MAKING WASHERS; Richard H. Cole, St. Louis, Missouri.

Claim—The loose bottom and the spring in connexion with the die.

223. Looms; George Crompton, Worcester, Massachusetts.

Claim—The employment of the two bars for holding up and holding down such of the series of jacks as are not required to be elevated or depressed at the forming of any shed, in combination with the jacks, the pattern cylinder or chain, and the lifter and depresser. Also, the holder bar, which acts on the ends of the heddle levers to hold them in their elevated or depressed position, until the beginning of the operation of opening a shed, in combination with the two bars for holding up and holding down such of the jacks as are not required to be shifted during the operation of opening a new shed.

224. Blowing Apparatus; David Cumming, Sorrel Horse, Pennsylvania.

Claim—1st, The bellows, in combination with exhaling bellows or receiver, when the former and latter are compressed by springs or weights of different capacities, in proportion to the exits of the said bellows, for the purpose of producing an uniform blast. 2d, The arrangement of the bellows, on the base, with the channel, valve, orifice, valve, and exit.

225. Joint for Spectacle Frames; George N. Cummings, Hartford, Connecticut.

Claim—The double conical shaped tube joint to spectacles.

226. Apparatus for Manufacturing Sulphuret of Carbon; Edouard Deiss, Paris, France; patented in France, November 13, 1855.

Claim—1st, The placing of the retorts over the principal flue, in order to obtain an intense heat at the base of the retorts. 2d, The earthen retorts, in combination with the crucibles or pots placed either within or outside the retorts. 3d, The grate for supporting the charcoal and tube, or its equivalent, for feeding in the sulphur, in combination with the crucible or retort for forming a chamber.

227. Processes for Extracting Fatty Matters; Edouard Deiss, Paris, France; patented in France, November 13, 1855.

Claim—The extraction of oils, grease, fats, and resins from wool, cloth, bones, oleaginous seeds, refuse, and other substances containing the same, whether naturally or artificially impregnated, by passing through them mechanically sulphuret of carbon.

228. Cotton Seed Planters; I. T. Donovan and W. J. Fowler, Sequin, Texas.

Claim—The combination of notched wheel, shaft, arms, and depending brushes thereof, with the circular hopper.

229. Harvesters; R. Dutton, Dayton, Ohio.

Claim—The employment of the loose hollow sliding sleeve, the hub of the driving-wheel, and the short axle, in combination with the slotted segment on the side of the platform, and the adjustable axle, when the slotted segment is provided on one of its inner sides with the cogs, and the axle with pinion on its inner and screw thread, and adjusting jamb nuts on its outer end.

230. Cotton Gins; John Du Bois, Greensboro', Alabama.

Claim—The use of the flanch on the face of the rib, that is to say, the flanch situated opposite the lower edge of the hopper board, with the lever end extending below that point, to separate the ginned seed from the cotton, and facilitate their passage from the roll-box.

231. Hatchet; N. F. English, Hartland, Vermont.

Claim—Forming the claw at the outer edge of the hatchet and over the eye or end of the handle.

232. Tuyere; George W. Finch, Gibraltar, Wisconsin.

Claim—The use of the two hollow cylinders, in combination with the slotted opening and the outlets, or more if necessary of varying form and size.

233. Cabbage Cutter; Adam Fischer, Dayton, Ohio.

Claim—The cabbage cutter, when all its parts are constructed and arranged for united operation.

234. Ruler; Thomas Fisher, Camden, New Jersey.

Claim—The application to rulers of india rubber, which will prevent the ruler from slipping, using for that purpose the aforesaid india rubber, or any other article substantially the same, and which will produce the intended effect.

235. Pencil Sharpener; Walter K. Foster, Bangor, Maine.

Claim—An improved article of manufacture, or a pencil sharpener, that is, of a steel or cutting blade and a cast metal body, cast or founded on the said blade, so as not only to confine it in its proper place with respect to the conical cavity of the body or holder, but so that the metal of the body or holder shall embrace opposite sides and the back of the blade, and terminate at or near the cutting edge of the blade by a surface made to stand at a right angle, or thereabouts, to the outer surface of the knife, the same, when the instrument is in use, serving not only to support the knife under pressure against its inner surface and cutting edge, but also to turn a chip or shaving, so as to enable the sharpener to operate to great advantage on the lead and wood of the pencil, particularly when the wood is cross-grained.

236. Buffer Heads for Railroad Couplings; M. C. Gardner, Rochester, New York.

Claim—The peculiar shape of the wrought iron bar and cast iron blocks, whereby the whole may be easily and firmly united by means of the band.

237. Liquids for Gas Metres; H. P. Gengembre, Rock Island, Illinois.

Claim—The use of an aqueous solution of deliquescent, metallic, and earthy salt or salts in gas metres, and the suspension in the upper stratas of the liquid of a base or carbonate of the base of the salt or salts employed.

238. Roofing Tiles; John F. Grassle, Hamilton, Ohio.

Claim—The groove in the outer tongue, the perforated flanch, shallow groove, and flanch of recess, in combination with the pin and lap of the adjacent tile. Also, the combination of the double grooves in the lap, tongues, flanches, recess, and shallow groove.

239. Pump Coupling; S. H. Gray, Bridgeport, Connecticut.

Claim—The curved or bow-shaped bar fitted underneath the lugs or projections on the base, and bearing on the flanch of the cylinder, the bar being adjusted by a thumb-screw.

240. Raking Attachment for Harvesters; George V. Griffith, Sandusky, Ohio.

Claim—The rotating rake and the reciprocating rake, combined and arranged to operate conjointly.

Also, the particular manner of operating respectively the rakes, through the medium of the grooves or guides, gearing which connect the two shafts, and the crank on shaft.

241. Churn; T. B. Harper, Xenia, Ohio.

Claim—The combination of the pinion disk and pin, and operating in relation to the winch and dashers.

242. Lock for Doors; James J. Hamilton, New Castle, Indiana.

Claim—1st, The slides. 2d, The double lift.

243. Combination Cooking Range and Gas Generator; A. Hendricks, Morrisania, New York.

Claim—The arrangement embracing a cooking range which has two fire chambers, two draft flues, and appropriate dampers, when used in connexion with a gas retort opening on the outside of the room.

244. Pen Cleaner and Holder; Thomas S. Hudson, Boston, Massachusetts.

Claim—Forming the inside of the stand with a tapering or beveled shaped neck, through which a bunch of bristles is drawn, whereby, when the bristles are fastened at their lower ends with cement or glue, they are so rigidly held as to prevent their being drawn out or displaced. Also, the use of a hollow stand, the lower portion or base of which is fitted with plaster of Paris, or other non-conductor of heat, whereby the cement or pitch in which the bottom of the bristles is embedded is protected, and prevented from being softened or melted by heat.

245. Cotton Harvesters; Miles Hosford and J. C. Avery, Macon, Mississippi.

Claim—Operating the endless chain of pickers through the medium of the pulley, spring, wheel, ratchets with pawls, and the gearing, or any equivalent device, whereby a reserve power is obtained as the implement is moved from boll to boll, so that the cotton may be picked or gathered therefrom as the implement is adjusted to the bolls.

246. Corn Harvesters; Adam Humberger, Somerset, Ohio.

Claim—The corn carrier and shocker provided with pulleys, interlocking at pleasure with wheels in connexion with the rope, said pulleys being operated by lever and rods for binding and shocking corn.

247. Steam Warming Apparatus; E. T. Ingalls and J. R. Nichols, Haverhill, Massachusetts.

Claim—1st, The device for increasing or diminishing the capacity of the fire chamber, so as to maintain a larger or smaller amount of fuel in a state of combustion. 2d, A vessel, in connexion with flexible pipe and spring, operating together for controlling a valve or valves affixed to boilers for regulating steam pressure. 3d, The device for supplying water to the boiler. 4th, In the construction of fluted or corrugated radiators of thin plates of iron, placing across the corrugations strips of metal securely fastened.

248. Hose Supporters; Asa Johnson, Cairo, New York.

Claim—The hose supporter, or its equivalent, for the purpose of supporting the hose and giving form to the limb.

249. Elliptic Cushion for Railroad Cars; Samuel R. Jones, York, Pennsylvania.

Claim—1st, The local relation and mode of application of the semi-elliptic buffer. 2d, The combination and arrangement of the elliptic cushion.

250. Field-Fence; Ebenezer E. Lewis, Geneva, New York.

Claim—The combination of the panels and posts of a fence, when arranged independently of each other.

251. Life and Treasure Buoy; Francis D. Lee, Charleston, South Carolina.

Claim—The arrangement of the escape valves, rods, chain, windlass, and the air valve and screw on the windlass shaft.

252. Breech-loading Fire Arm; Thomas Lee, City of New York.

Claim—1st, The breech-piece on its centre pin, in combination with the lever, blocking piece, and cam-shaped end. 2d, The manner of delivering the detonating pillets and shutting off fire from the same, by the use of the inclined ended rods and shield.

253. Corn Planters; Oliver Lippincott, Camden, New Jersey.

Claim—The arrangement of the plough and its beam with frame and its hopper, weight, slide, wheel, and covering share.

254. Toy; Conrad Liebrich, Philadelphia, Pennsylvania.

Claim—Arranging certain numbers, letters, words, or other signs upon two, three, or more disks, and combining them with certain devices for setting the disks in motion, and stopping them in such a way that after each stoppage the relative position of the disks shall be changed, so as to show a different relative position of those numbers, letters, words, or other signs, upon the circumference of the disks, and arranging the whole in such a manner that the nature of the change in the relative position of the disks after each stoppage will be a matter of accident.

255. Spike Machine; Michael Loughran, Pittsburgh, Pennsylvania.

Claim—The employment of dies working on separate shafts and forming spikes at a single revolution.

256. Protecting Gilding on Glass; Peter V. Mathews, Philadelphia, Pennsylvania.

Claim—The use of the tin-foil, or other thinly laminated or rolled metal, as a backing for the gilded letters, figures, &c., which are generally required on the inner surfaces of the panes of glass of windows, transoms, and doors of stores, offices, hotels, &c., for the purpose of securing and protecting the said letters, figures, &c., from being damaged, and without obstructing the free passage of the rays of light through the immediately surrounding parts of the glass from either side of the same.

257. Machines for Making Horse Shoes; John McCarty, Philadelphia, Pennsylvania.

Claim—1st, The combination of the mandrel with the rollers, when the said mandrel is of the same form as that presented by the inner edge of the shoe to be manufactured, when it is so operated as to convey the bent bar to dies, there retain it while it is submitted to the action of the said dies, and subsequently withdraw the formed shoe from the same, and when the rollers are caused to approach each other as the mandrel advances. 2d, The jaws, the reciprocating mandrel, with its projection underneath the lower die, with its recess for receiving the projection of the mandrel, and with its projecting lip and the upper die, when the said dies, mandrel, and jaws are arranged to close and lap over each other, and when they are otherwise arranged and actuated. 3d, Piercing the requisite nail holes in the shoe by means of the punches, when the same are attached to the plates, when the latter are hinged to the guide blocks, and when the upward movement of the latter is regulated by the adjustable wedges.

ABSTRACTS OF SPECIFICATIONS OF RECENT PATENTS.

FROM H. HOWSON'S PATENT AGENCY, PHILADELPHIA.

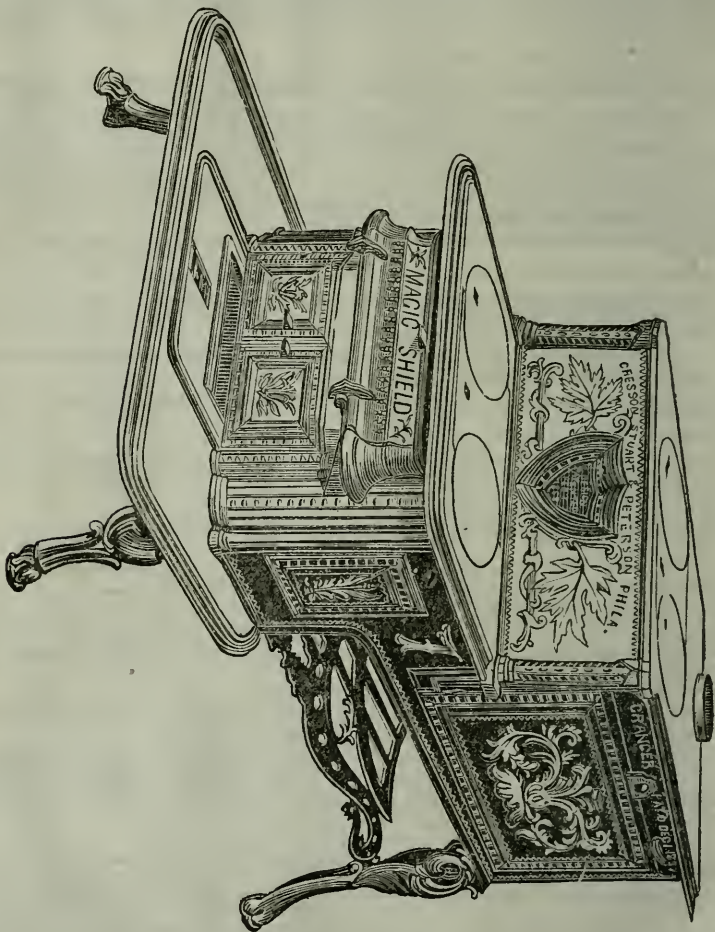
For the Journal of the Franklin Institute.

R. D. Granger's Improved Cooking Stove.

Patent granted December 1st, 1857.

This invention, which is an improvement on that for which a patent was granted to R. D. Granger, on the 21st of March, 1848, consists in forming underneath the oven a chamber, through which a current

Fig. 1.



of cold air, entering at the rear of the stove, may pass into a space between the back of the fire-place and front of the oven, and from thence either into the interior of the latter, or into the external atmo-

sphere, the cold air chamber serving the purpose of dividing the flue, for the passage of the products of combustion under the oven to the chimney.

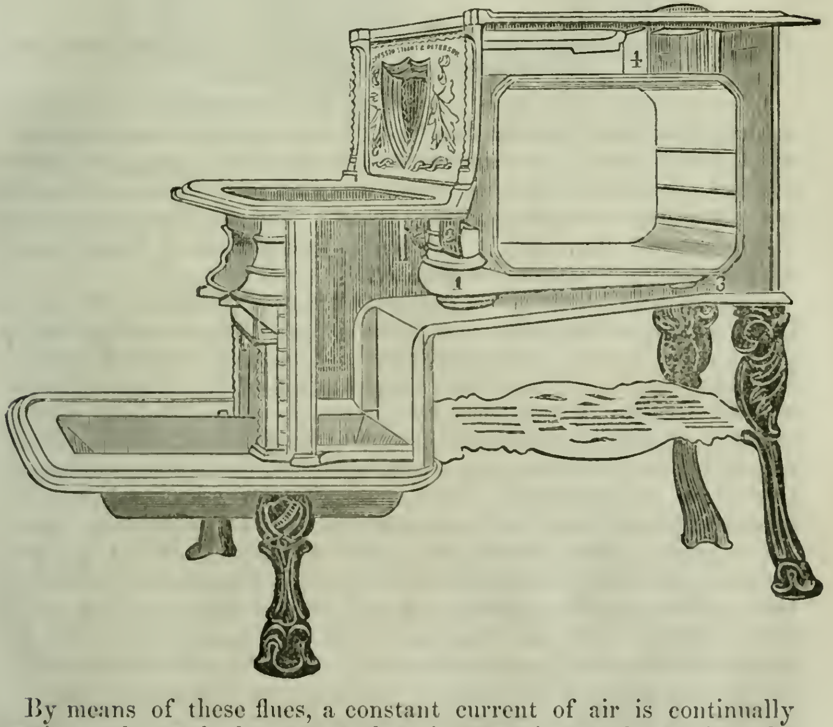
The object of this arrangement is to counteract the excessive heat on the bottom of the oven, and, at the same time, to divide and disperse the products of combustion underneath the same.

Fig. 1 Is a perspective view of the improved cooking stove.

Fig. 2 Perspective view of the same with one side removed, so as to show the interior arrangements.

The exterior form of the stove differs but little from that of ordinary cooking stoves. Above the oven is the usual passage, forming a communication between the fire-place and the chimney, with which a lower passage, divided in the centre by the air-flue 1, (Fig. 2,) also communicates. At one end of this air flue is situated the orifice 3, and, at the other end, the vertical flues 2, which communicate through orifices in the side plates of the stove, with the external atmosphere, and also with the interior of the oven through any convenient number of openings.

Fig. 2.



By means of these flues, a constant current of air is continually passing underneath the oven, and, as it enters in a cool state into the horizontal flue 1, through the orifice 3, it absorbs a portion of the intense heat to which the bottom of the oven is subjected, and, rising through the flues 2, either enters the oven, or passes out through the side orifices into the external atmosphere. An ordinary damper is

situated at the top of the oven for retaining the heat within, or allowing it to escape from the same.

By means of a valve 4, the amount of the products of combustion passing above and below the oven may be regulated at pleasure. A hollow wedge-formed division is situated at the point where the products of combustion pass from the fire-place to the passage above the oven, in order that the heat before entering the chimney, may be dispensed and caused to pass beneath the openings, above which are situated the cooking utensils.

When the valve 4 is in such a position as to cause the products of combustion to pass underneath the oven and upwards, at the back of the same to the chimney, an undue amount of heat would be imparted to the bottom plate of the oven, were it not for the horizontal flue 1, along which passes a constant supply of cool air, which counteracts this excess of heat. At the same time this cool air absorbs a sufficient quantity of heat to cause it to rise through the flues 2 into the oven, or out of the side orifices into the external atmosphere.

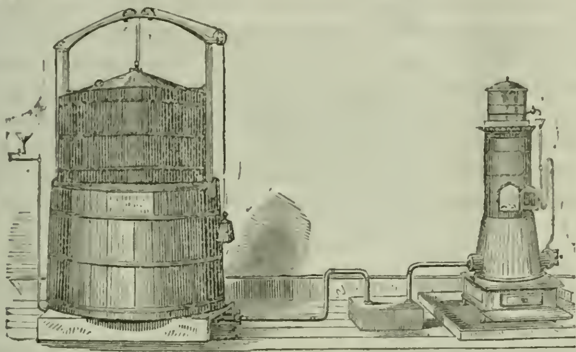
Manufactured by Messrs. Cresson, Stuart & Peterson, of this City.

Improved Gas Apparatus. Patented by D. L. Weatherhead and J. T. Henry, April 6th, 1857.

This invention consists in generating gas in a cylinder containing a second perforated cylinder filled with broken pumice stone, the exterior cylinder being in constant communication with a supply of material to be generated into gas, so that the whole may form a continuous gas generating and gas purifying retort. The gas thus generated is discharged into the gasometer in minute jets or films, at a point below the level of the water in said gasometer.

This invention, an exterior perspective view of which is represented in the accompanying figure, consists of a cylinder passing through a fire chamber or stove, and also through the fuel contained therein. This stove may be of the ordinary construction, with a door for the admission of fuel, and a chimney for the escape of the products of combustion. Within the abovementioned cylinder, both ends of which project beyond the stove, is a second cylinder, shorter than the first. One of the projecting ends of the external cylinder is closed, with the exception of an orifice for the admission of a pipe, seen in the figure. The opposite or front end of the cylinder is furnished with a detachable cover to allow of the withdrawal of the internal or second cylinder. Each end of the latter cylinder is enlarged, so that a small space is left between its body and the inside of the external cylinder. The internal cylinder is perforated with small holes, and is furnished with a rod for extracting it from the external cylinder. Communicating with the front of the latter, is a syphon-formed pipe, furnished at the top with a funnel-shaped mouth. A vessel for containing oil or fatty matter is attached to the chimney, so that the heat from the same may maintain the contents of the vessel in a fluid condition, and be conveyed to the outer end of the external cylinder, through the syphon-

formed tube abovementioned. From the orifice in the other end of the cylinder passes a pipe communicating with the well of the gasometer, through which it passes upwards into the gas chamber above the level of the water, where it is so bent that the bent end may terminate some distance below the water level. The extreme end of the pipe is enlarged, and the lower portion of this enlargement is perforated with small holes or narrow slits; or the end of the pipe may be formed in any other manner, by which the gas may be allowed to escape into the water in minute jets or thin films.



The inner perforated cylinder having been filled with pumice stone broken into pieces about the size of a walnut, is placed within the external cylinder, the cover put on the end, and the fuel in the fire chamber ignited. The oil or fatty matter is allowed to drop into the funnel-mouth of the syphon-formed pipe, which conveys it to the projecting end of the external cylinder. Here the gas is generated in an impure state, and from thence it passes through the interstices formed by the broken pieces of pumice stone in the inner perforated cylinder, and thence in a pure state to the gasometer.

After repeated experiments with the different materials, pumice stone has been found to answer best for the desired purpose, as it is indestructible as regards the action of the fire, and of such a porous nature as to absorb all the moisture of the gas, and to assist in the extraction of the tar from the same.

This tar passes through the interstices of the broken pieces, and through the perforations of the inner cylinder, and is brought into contact with the heated exterior cylinder, where all the useless refuse portions of the tar are consumed, the gas passing off through the pumice stone and perforations to the pipe communicating with the gasometer.

It will thus be seen that the outer cylinder and inner perforated cylinder, with its pumice stone, form, when combined, a purifying gas retort, and that the usual and cumbrous purifying apparatus is dispensed with.

The gas having left the retort, passes in a purified but heated state to the gasometer, and is discharged into the same, through the perforated end of the pipe, at a point below the level of the water in the

chamber of the gasometer. It then rises above the level of the water, and being cooled by contact with the latter, passes through the distributing pipe to the burners.

One great advantage of this peculiar manner of discharging the gas into the gasometer is, that no explosion of the gas contained therein can take place, for, even should the fire ignite the gas in the retort through the wearing away of the latter, the flame, after passing through the communicating pipe, would be extinguished by the water before it could reach the gas in the chamber.

Although allusion has been made to the use of oil and fatty matter as the substances from which to generate the gas; it should be understood, that the above mentioned purifying retort, as well as the cooling and safety apparatus, are equally applicable to the generation of pure and cool gas from other known gas-producing substances. The main aim of the inventors has been to construct a portable gas apparatus at a comparatively trifling cost, and one occupying but little space.

Manufactured and erected by Henry & Campbell, No. 24, South Fifth St., Philada.

Improved Water Closet. Patent granted to J. T. Henry & W. P. Campbell, December 29th, 1857.

This invention consists in so combining the basin of a water closet with a valved chamber, cistern, and communicating pipes, that the soil may be readily and effectually disposed of and all offensive smell obviated.

Fig. 1 is a perspective view of the improved water closet with the lid raised.

Fig. 2 is a sectional view of the same.

A A A, (Fig. 2,) represents the bottom and sides of an oblong box, which contains the basin C, valve chamber D, and cistern E. The cover B of the box has the usual opening *a*, and the ordinary hinged lid *b*. The basin C has a curved pipe communicating with the valved chamber D. In the latter is a conical valve *d*, arranged so as (when depressed) to stop the communication between the chamber D and the exit pipe.

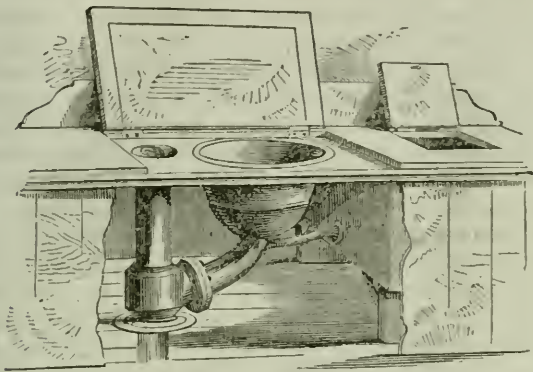
Attached to the valve *d* is a spindle *f*, guided by a cross-bar *h*, in the pipe *g*, which terminates at an opening *i* in the cover B, the spindle *f*, being furnished at the top with a handle *j*, by means of which, the valve *d* may be lifted at pleasure. A pipe F, forms a communication between the cistern E and the curved pipe *c* of the basin C.

The cistern is maintained nearly full of water at an uniform level, by means of the usual ball-cock, or other convenient apparatus, connected with the water pipe, and the cistern is so situated, that the water therein shall be level with that in the basin C and pipe *g*.

The soil in the basin C is carried off by raising the valve *d* above the opening from the pipe *e*, into the chamber D, when the water and soil rush into the latter, and thence through the exit pipe *e*, an impetus being given to this discharge of the water and soil, by the rush of water from the cistern E through the pipe F into the curved pipe C of the

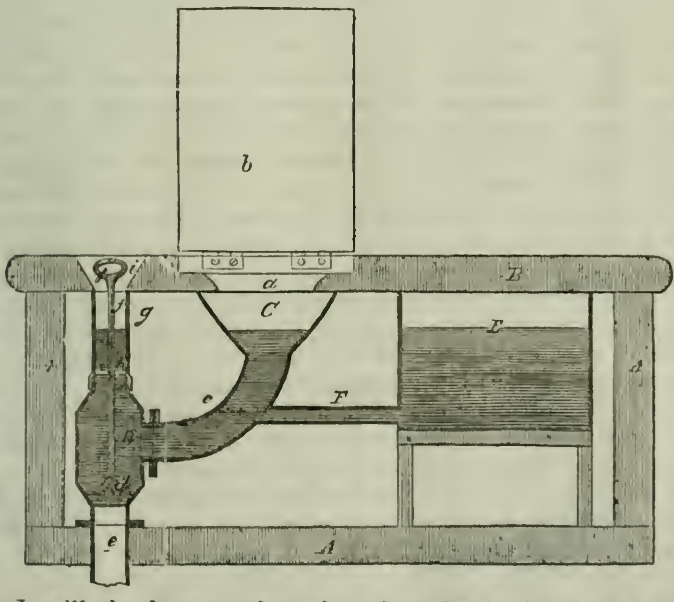
cistern. The valve *d* is then closed, when the water assumes its former level, as shown in Fig. 2. By the peculiar construction of the valved chamber D, and its position, as regards the opening of the pipe C into the same, it will be seen that the valve *d* may be raised sufficiently

Fig. 1.



high above the said opening to prevent the possibility of portions of the soil adhering to the valve, and, when the latter is closed, rendering the water in the basin foul and offensive as in the other water closets.

Fig. 2.



sets. It will also be seen that when the valve is closed, it is entirely covered with a supply of pure water, which effectually prevents the rising of all noxious exhalations through the exit pipe *e*.

Manufactured and erected by the patentees, No. 24 South Fifth Street, Philadelphia.

MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

Description and some Account of the Working of Mackenzie's Cupola.

Messrs. I. P. Morris & Co. have lately put in use at their Port Richmond Iron Works, Philadelphia, two of Mackenzie's patented cupolas in the place of two built in the old style; and, the following statement shows the important gain resulting from the improved cupola, which may be described thus: the shell at the base is oval, having a major diameter of 11 feet, and a minor diameter of 5 feet, and retains these dimensions until it reaches a height of 7 feet, when the major diameter reduces until, at a height of $16\frac{1}{2}$ feet, it becomes equal to the minor diameter, and the shell assumes a cylindrical shape. The hearth is also oval, and is $9\frac{1}{2}$ feet long by 4 feet wide, with an inclination of 3 inches in the direction of its length in order to drain the metal. The lining of the hearth proper, rises $9\frac{1}{2}$ inches at the tap hole, and $6\frac{1}{2}$ inches at the opposite side; thus the top edge is horizontal. Above this, and extending completely around, a space of $1\frac{1}{2}$ inches is left for the entrance of the blast; above this a funnel-shaped flanch rises about 3 feet, until its expanded upper edge reaches the shell to which it is riveted, the lower part being stayed to the shell. This serves as a blast chamber, and also as a support for the charge: around its lower edge an angle iron is riveted, and upon it the lower course of the lining rests, the inner edges of the bricks projecting two inches beyond the lining of the hearth. Two charging doors, 3 feet high by $4\frac{1}{2}$ feet wide, are placed opposite each other upon the flat sides, about 8 feet above the hearth. The other details are similar to those used upon the old style cupolas. The advantages of the patented cupola are: the tapering shape given to the lining just above the hearth sustains the superincumbent mass of the charge, and causes a space or partial space, between it and the hearth for the reception of the melted metal, and for the free passage of the blast under the mass of the fuel; the blast enters in a thin sheet, and, from the peculiar shape of the cupola, does not move over 2 feet before it encounters that coming from the opposite parts; consequently, it is evenly distributed, insuring uniformity in the combustion of the fuel; the shape of the hearth permits the charging with entire pigs, saving the labor of breaking; and, lastly, the space below the blast passage being comparatively unoccupied by the charge, permits a large quantity of molten metal to be accumulated in it when a heavy casting is to be poured, rendering it unnecessary to store the metal in ladles until the required weight is melted.

The old style cylindrical cupola taken out was 44 inches in diameter at hearth; and its average rate of melting was about 5000 ℔s. per hour with a consumption of 900 ℔s. of coal, or about $5\frac{1}{2}$ to 1, and a blast pressure of 24 oz. The greatest quantity ever melted by it was 8000 ℔s. per hour. The average result of the Mackenzie cupola is 20,000 ℔s. per hour, consuming 2500 ℔s. of coal, or 8 to 1; and a blast pressure of 6 oz. Best result 24,000 ℔s. per hour. This cupola will contain 38,000 ℔s. of iron at a charge, and with a supply of 3600

cubic feet of air per minute, at the above pressure, will run a continuous stream of hot metal. The mode of charging is this: to bed with 2500 lbs. of coal, upon this 10,000 lbs. of whole pigs, then 800 lbs. of coal, again 10,000 lbs. of pigs, then 800 lbs. coal, and so on until 25 tons are charged.

The working of this cupola was deemed so satisfactory, that Messrs. I. P. Morris & Co. determined to put in a second one of a smaller capacity for moderate heats: accordingly, a 44-inch cylindrical cupola was altered to Mackenzie's arrangement, retaining above the tuyere about the same capacity, but below it, the capacity was reduced one-fifth.

The operation of this cupola, before and after the change, proved conclusively the economy resulting from it, and will be seen from the following statement of thirteen ordinary heats:

OLD STYLE CUPOLA.			MACKENZIE'S CUPOLA.		
Metal.	Coal.	Time.	Metal.	Coal.	Time.
lbs.	lbs.	h. min.	lbs.	lbs.	h. min.
12,000	2200	2 30	12,000	1700	2 05
17,000	3500	3 20	17,000	2000	2 30
16,500	3200	3 00	16,500	1900	2 37
10,500	2000	2 15	10,500	1400	1 49
12,000	2250	2 30	12,000	1600	1 47
11,000	2160	2 30	11,000	1600	1 57
17,000	3700	3 35	17,000	2000	2 30
12,000	2100	2 25	12,000	1700	1 55
11,500	2100	2 20	11,500	1600	1 55
15,000	2700	2 50	15,000	1600	2 20
10,300	1950	2 00	10,300	1500	1 43
13,300	2140	2 25	13,300	1800	2 00
10,500	1950	2 10	10,500	1500	1 40
*168,600	31,950	33 50	168,600	21,900	26 48

Thus it will be seen that in melting the same quantity of metal, there was a

Saving of coal, 31,950 lbs.—21,900 lbs. = 10,050 lbs.
" time, 33 h. 50 m.—26 h. 48 m. = 7 h. 02 m.

The duration of the heats in each case, was counted from the time of putting in the blast until the hearth was dropped.

The pressure of blast in old style cupola was 22 oz.; ditto in Mackenzie's 11 oz.

Four hands were required to work the old style cupola, while three will suffice for Mackenzie's; and the proportion of coal to iron melted is in the one case, 1 to 5·28, and in the other, 1 to 7·74.

The new cupola is charged in this way: first, a bed of 1200 lbs. of coal, then 5000 lbs. of metal, next 200 lbs. of coal, then 3000 lbs. of metal, again 200 lbs. of coal, and so on until 16 or 18,000 lbs. of metal are charged. The charging is made in about one hour after lighting up, and usually, the metal runs in from eight to ten minutes after the blast is put in.

W. J.

* The amounts of metal melted in the Mackenzie cupola should not be taken as the best effect, as it has not yet been urged with a full charge of metal for a heavy casting, but it is expected to give 14,500 lbs. per hour when required.

For the Journal of the Franklin Institute.

Particulars of the Steamer Japanese.

Hull built by Wm. Webb. Machinery by Novelty Iron Works, New York. Built for the Russian Government.

Hull.—			
Length on deck,		214 feet.	
" at load line,		212 "	
Breadth of beam (molded),		36 "	
Depth of hold,		10 "	
" " to spar deck,		17 "	
Length of engine room,		20 "	
Draft of water,		12 "	6 inches.
Tonnage, hull,	950.		
Tonnage, engine room and bunkers,	350.		
Area of immersed section at load draft,	380 sq. ft.		
Contents of bunkers,	400 tons.		
Masts, three—rig, barque.			
Engines.—Horizontal oscillating.			
Diameter of cylinder,			51 inches.
Length of stroke,		3 feet.	
Maximum pressure of steam,	25 lbs.		
Cut-off—1-6 to 2-4.			
Maximum revolutions at above pressure,	50.		
Weight of engines,	234,000 lbs.		
Boilers.—Two—Return flued.			
Length of boilers,		24 feet	6 inches.
Breadth "		12 "	9 "
Height " exclusive of steam chimney,		12 "	9 "
Weight of " with water,	138 tons.		
Number of furnaces,	10.		
Breadth "		3 "	
Length of grate bars,		6 "	9 "
Number of flues,	above, 18—below, 15.		
Internal diameter of flues—above, 11 ins. and 13 ins.—below, 15 inches.			
Length of flues—above, 18 feet 9 ins.—below, 12 feet.			
Heating surface,	5728 sq. ft.		
Diameter of smoke pipe,		6 feet	3 inches.
Height " " (telescopic),		36 "	6 "
Propellers.—			
Diameter of screw,		11 feet.	
Pitch "		21 "	
Number of blades,	3.		

Remarks.—Frames, *molded*, 15 ins.—*sided*, 15 ins. 30 inches apart from centres, strapped with diagonal and double laid braces $4\frac{1}{2}$ inches by $\frac{3}{4}$-inch. Depth of keel, 12 inches. Independent steam, fire, and bilge pump, one; bulkheads, two. C. H. H.

Analysis of Milk and Flour. By M. E. Monier.

If into milk diluted with water and acidulated, a solution of cameleon-mineral is slowly dropped, the beautiful color of the mineral is seen to disappear. The study of the re-action shows that it is due to the caseine and albumen, and not to the butter or sugar.

Take 10 cubic centimetres (about $\frac{1}{5}$ pint) of milk, and bring it to a temperature of from 113° to 122°. Prepare a liquor containing 2 ℔

cent. of albumen, and ascertain the volume of the solution of cameleon which is all necessary to produce a given tint in this liquid. Dilute and acidulate the milk with some acid which will not coagulate either the albumen or the caseine, and determine the quantity of the cameleon solution necessary to produce in it the same tint which has been produced in the standard liquor. A simple proportion will then give the quantity of albumen and caseine contained in the milk.

Take another equal quantity of the milk at the same temperature as before, and by a drop of acetic acid coagulate the caseine, which will carry the butter with it. Filter the whey, wash it well, acidulate it, and determine the quantity of cameleon necessary to produce the standard tint in it. Equal weights of caseine and albumen decompose equal volumes of the solution of cameleon. Hence, by subtracting the weight of the albumen from that at first determined, the weight of the caseine will be found. The butter may then be found by subtracting the weight of the caseine from that of the dried curd, (or if greater accuracy is required, it may, of course, be extracted by ether.)

The mode of analyzing flour rests upon these principles:—

1st. That the azotized principles are totally soluble in dilute hydrochloric acid.

2d. That the solution of cameleon is decomposed by these azotized matters.

3d. That the non-azotized matters, (starch, dextrine, &c.,) have no action on it.

M. Monier uses a standard flour which has been carefully analyzed and kept in close stoppered bottles from air and moisture. 0·3 grms. (4½ grains,) of this flour is put into a mattrass and boiled for a few moments with diluted hydrochloric acid. The same is done with an equal quantity of the flour to be tested; the liquids are added to equal quantities of the solution of cameleon until the same tint is obtained, and as the azotized matter of the standard flour is known, that of the sample is obtained by simple proportion.

The non-azotized principles are determined by thoroughly drying the flour and subtracting from its weight that of the azotized matters.

Legumine re-acts upon the cameleon like albumen, whilst the vegetable alkalies, milk, &c., have no action.—*Comptes Rendus de l'Academie des Sciences de Paris.*

For the Journal of the Franklin Institute.

Alger's New Form of Blast Furnace.

Charles C. Alger, of the State of New York, has devised a novel form of blast furnace from which he expects important results.

Mr. Alger is a practical iron-master of twenty years' experience, whose observation upon hard coal furnaces, seems to have led him to the fact that anthracite furnaces as now blown with a pressure not over five pounds to the inch, cannot be advantageously built with a larger crucible than 6 feet diameter at the "*tuyere line.*"

To reduce larger quantities of ore with the same fuel, and a pressure limited within five pounds per inch, Mr. Alger has conceived a change in the horizontal section of the crucible, the bosh, and the stack.

All his horizontal sections are ellipses of greater or less eccentricity. His crucible at the "*tuyere line*" being a much elongated ellipse, approximating a narrow parallelogram in its horizontal section, which, at the "*bosh*," becomes an ellipse with axes of 18 and 7, and at the top of the stack, of 14 and 5.

He proposes to blow his new form of furnace by numerous "*tuyeres*" along the larger side of the crucible, (sometimes six on each side,) while at the narrow ends of the crucible are two dam stones of the usual arrangement, so as to admit of working, and drawing at both ends of the elongated hearth. With this elliptical furnace, and the introduction of the blast at many points, (on the longer side of the *hearth*) so as to act efficaciously upon the narrow diameter of the crucible, he expects to effect a much larger reduction of ore with the improved stack, and at considerably less expense in every particular.

We take pleasure in recommending Mr. Alger's proposition to our readers as promising results of some consequence to the manufacture of pig iron.

Mode of Detecting Decay in Timber.

The *Cosmos* reports from other journals, a simple mode said to have been adopted from immemorial times in the ship-yards of Venice for ascertaining the fitness of timber for their constructions. "A person applies his ear to the middle of one of the ends of the timber, while another strikes upon the opposite end. If the wood is sound and of good quality, the blow is very distinctly heard, however long the beam may be. If the wood were disaggregated by decay or otherwise, the sound would be for the most part destroyed."

For the Journal of the Franklin Institute.

Description of Paraselenes Observed on the 27th of April, 1858.

By James M'Clune.

The paraselenes or mock-moons which were visible on the 27th of April, 1858, merit at least a record, both on account of their distinctness and the rareness of the phenomenon. While halos are much more frequently observed around the moon than the sun, mock-moons are more seldom seen than mock-suns. I have observed a paraselene but once before in thirty years, and many others have not noticed the phenomenon in even a longer period. That paraselenes are visible at very distant intervals, except in high latitudes, in other countries as well as our own, is evident from the fact, that comparatively few observations of them are recorded.

The phenomenon of the 27th of April, was visible from half-past

seven o'clock, P. M., until half-past ten o'clock P. M. The thermometer at nine o'clock, P. M., stood at 40°, and the barometer at twenty-nine and seven-tenth inches. About three-fourths of the sky was overspread with light clouds.

At eight o'clock the phenomenon exhibited nearly all the usual attendants of parhelia, thus proving it to be due to like causes. Two very bright paraselenes appeared at the same height as the moon, one on the eastern and the other on the western edge of a halo, while a third paraselene, but more faint than the other two, was visible at the upper part of the halo directly between the moon and the zenith.

The halo, except at the inner edge where red predominated, was of a dark grey color.

At the same time bands, or rather cones of light, could be seen extending seven or eight degrees from the moon toward the paraselenes, forming an imperfect cross, of which the moon occupied the centre.

At half-past nine o'clock a second halo encircling the first, could easily be perceived, while the paraselenes of the same height as the moon, exhibited a cone of light extending from them in a horizontal direction on the side opposite the moon, giving to each of them the appearance of a huge comet. The paraselene at the apex of the halo was scarcely visible, and the cones of light extending from the moon could no longer be seen.

At ten o'clock the paraselene to the east of the moon was still visible; the one to the west could with difficulty be perceived, and the second halo had entirely disappeared, but the circumzenithal arc, which had not been visible before, was plainly, though not strongly defined.

The phenomenon, when first observed, was nearer the horizon than halos usually appear.

The last two months have been somewhat remarkable for atmospheric and other phenomena. The zodiacal light has been unusually brilliant, and the Aurora Borealis has appeared with a frequency and a beauty which are certainly remarkable in this latitude.

Peculiar conformations of clouds have also been noticed on several occasions. On the evening of the twentieth of March, clouds of only a few degrees in breadth were observed, extending in some instances from the horizon to the zenith, and presenting many of the protean forms of the Aurora Borealis. These had scarcely disappeared when ray-like clouds became visible in the south-west, radiating from a point at an elevation of about 40°, and these clouds, in turn, were quickly succeeded by others of an equally peculiar form in the south.

On the following week, four strata of clouds were noticed.

The question might be asked, have these peculiar atmospheric appearances any connexion with the absence of strong winds, and the long period of dull weather which immediately succeeded the greater part of them?

The increased brightness of the zodiacal light is probably owing to a difference in the state of our atmosphere, and not to any change in the self-luminous matter of that unexplained phenomenon.

*On the Phenomenon of Relief of the Image formed on the Ground Glass of the Camera Obscura.** By A. Claudet, Esq., F. R. S.

[Read before the Royal Society, June 18th, 1857.]

The author having observed that the image formed on the ground glass of the camera obscura appears as much in relief as the natural object when seen with the two eyes, has endeavored to discover the cause of that phenomenon, and his experiments and researches have disclosed the singular and unexpected fact, that although only one image *seems* depicted on the ground glass, still each eye perceives a different image; that in reality there exist on the ground glass two images, the one visible only to the right eye, and the other visible only to the left eye. That the image seen by the right eye is the representation of the object refracted by the left side of the lens, and the image seen by the left eye is the representation of the object refracted by the right side of the lens. Consequently these two images presenting two different perspectives, the result is a stereoscopic perception, as when we look through the stereoscope at two images of different perspectives.

It appears that all the different images refracted separately by every part of the lens, are each only visible on the line of their refraction when it corresponds with the optic axes, so that while we examine the image on the ground glass, if we move the head we lose the perception of all the rays which are not corresponding with the optic axes, and have only the perception of those which, according to the position of the eyes, gradually happen to coincide with the optic axes. Consequently when we look on the ground glass perfectly in the middle, the two eyes being equally distant from the centre, the right eye sees only the rays refracted from the left of the lens, and the left eye only those refracted from the right of the lens.

If we move the head horizontally, as soon as we have deviated about 6° from the centre on the right or on the left, in the first position the right eye sees no image, and the left eye sees the image which before was seen by the right eye; in the second position the inverse takes place, and of course in both cases there cannot exist any stereoscopic illusion.

When we examine on the ground glass the image of a solid produced by the whole aperture of the lens, if we have taken the focus on the nearest point of the solid, we remark, in looking with the two eyes, that the image is stereoscopic, and as soon as we shut one eye the illusion of relief disappears instantly.

The stereoscopic effect is beautifully brought out by the image of a group of trees; and when experimenting in an operating room, it is rendered quite conspicuous if we take the image of an object having several planes very distinct, such as the *focimeter*, which the author has described in a former memoir (see *Phil. Mag.* for June, 1851).

If without altering the focus we examine the same image with the pseudoscope, the effect is pseudoscopic. But if the focus has been set on the most distant plane of the focimeter, the effect is pseudoscopic, and it becomes stereoscopic in looking with the pseudoscope.

*From the Lond. Edin. and Dub. Phil. Mag., May, 1858.

The image loses its relief when it is produced only by the centre of the lens. The stereoscopic and pseudoscopic effects are therefore as much less apparent as the aperture of the lens has been more reduced, and they are the more evident if the image is produced by two apertures on both extremities of the horizontal diameter of the lens. This mode of conducting the experiments presents the most decided manifestation of the whole phenomenon.

But it must be remarked, that if the image is received on a transparent paper instead of ground glass, it does not in any case present the least illusion of relief. The surface of the paper has the property of preserving to both eyes the same intensity of image from whatever direction the rays are refracted on that surface, and at whatever angle the eyes recede from the centre to examine the image. In fact, all the various images refracted through every part of the lens and coinciding on the surface of the paper, are visible at whatever angle they are examined.

The reason of this difference between the effect of the ground glass and that of the paper is, that through the surface of the ground glass, composed of innumerable molecules of the *greatest transparency*, only deprived of their original parallelism by the operation of grinding, but acting as *lenses* or *prisms* disposed at all kinds of angles, the rays refracted by the various parts of the lens continue their course in straight lines in passing through these transparent molecules, and are visible only when they coincide with the optic axes, being invisible in all other directions; that, in short, they are not stopped by the surface of the ground glass; while the paper being perfectly opaque, stops all the rays on their passage, by which the image of the object remains fixed on the surface. Each molecule of the paper becoming luminous, sends new rays in all directions; and from whatever direction we look on the paper, we always perceive at once all the images superposed, so that each eye seeing the two perspectives mingled, the process of convergence according to the horizontal distances of the same points of the various planes, cannot have its play, and no stereoscopic effect can take place, as is the case with the ground glass, which presents to each eye an image of a different perspective.

The author explains that he has ascertained these facts by several experiments, the most decisive of which consists in placing before one of the marginal openings of the lens a blue glass, and a yellow glass before the other. The object of these colored glasses is to give on the ground glass two images, each of the color of the glass through which it is refracted.

The result is two images, superposed on the ground glass, one yellow and the other blue, forming only one image of a grey tint, being the mixture of yellow and blue, when we look with the two eyes at an equal distance from the centre. But when shutting alternately, now the right eye and then the left eye, in the first case the image appears yellow, and in the second it appears blue.

If while looking with the two eyes (the opening on the right of the lens being covered with the yellow glass, and the opening on the left

with the blue glass) we move the head on the right of about 6°, the mixture of the two colors disappears, and the image retains only the blue color; on the other hand, if after having resumed the middle position, which show again the mixture of the two colors, we move the head on the left of 6°, the mixture disappears again, and the image retains only the yellow color.

This proves evidently that each eye sees only the rays which, when after having been refracted by any part of the lens, and continuing their course in a direct line through the ground glass, coincide with the optic axes, while all the other rays are invisible.

The consideration of these singular facts has led the author to think that it would be possible to construct a new stereoscope, in which the two eyes looking at a single image could see it in perfect relief, such a single image being composed of two images, of different perspectives superposed, one visible only to the right eye and the other to the left. This would be easily done by refracting a stereoscopic slide on a ground glass, through two semi-lenses separated enough to make the right picture of the slide coincide with the left picture at the focus of the semi-lenses. The whole arrangement may be easily understood; we have only to suppose that we look through a ground glass placed before an ordinary stereoscope at the distance of the focus of its semi-lenses, the slide being strongly lighted, and the eye seeing no other light than that of the picture on the ground glass. The whole being nothing more than a camera having had its lens cut in two parts, and the two halves sufficiently separated to produce at the focus the coincidence of the two opposite sides of the stereoscopic slide placed before the camera.

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*Description of the Stereomonoscope.** Invented by A. Claudet, Esq., F. R. S.

[Read before the Royal Society, April 15, 1858.]

Mr. Claudet presented a new optical instrument of his invention, called the Stereomonoscope, by which, as its name implies, a single picture produces the stereoscopic illusion. In the centre of a large black screen there is a space filled with a square of ground glass, upon which, by some light managed behind the screen, is thrown a magnified photographic image representing a landscape, a portrait, or any other object. When we look naturally at that picture, with the two eyes, without the help of any optical instrument, an extraordinary phenomenon takes place: we see the picture in perfect relief as when we look at the two different pictures through a stereoscope. It is not necessary to be at a fixed distance from the picture: it may be examined as well at ten feet as at one foot, as an ordinary picture, without the least fatigue to the eyes. Although considerably enlarged by the instrument itself, we may magnify the picture still more by using large convex lenses; and two or three persons at once can examine it with the greatest ease, being able, while looking, to exchange any remarks, or express the sensations suggested by the picture,—an advantage

* From the London Athenæum, April, 1858.

which is denied by the use of the common stereoscope. By this remarkable discovery, Mr. Claudet has solved a problem which has always been considered as an impossibility by scientific men,—for the Stereomonoscope, by its very name, must sound like a paradox to the ears of all those who are versed in the knowledge of the principles of binocular vision, until they have had the opportunity of repeating the experiments by which the author has found a new fact which they had not noticed or explained before. This new fact is, that the image on the ground glass of the camera obscura produces the illusion of relief. But the phenomenon does not take place if the image is received on paper. When the medium is ground glass, the rays refracted by various points of the lens upon that surface, are only visible when they are incident in a line coinciding with the optic axes. So that the rays emerging from the ground glass, and entering the right eye, are only those which have been refracted obliquely in the same direction, by the left side of the object-glass; and those entering the left eye, are only those which are refracted by the right side of the object-glass: consequently, both eyes have a different view and perspective of the object represented on the ground glass, and the single image is, in point of fact, the result of two images, each only visible to one eye, and invisible to the other. This is the main point of Mr. Claudet's discovery, which cannot be fully understood without reading the paper which he communicated on that subject to the Royal Society, the 8th of May, 1857 (see *Proceedings of the Royal Society* for May, 1857.)* and without repeating the experiments described in that paper. The Stereomonoscope is founded on the same principles: it is nothing more than a camera obscura, before which are placed the two images of a stereoscopic slide, and by means of two object-glasses, sufficiently separated, the two images are refracted on the same space, at the focus of the camera-obscura on the ground glass, where they coincide. By the same laws we have alluded to before, the right picture is seen only by the left eye, and the left picture by the right eye; so that, although only one picture appears represented on the ground glass, each eye sees on the same spot a different picture having its particular perspective, and, consequently, in order to obtain a single vision, the eyes have to converge differently to bring consecutively in the centre of both retinas the different similar points of the two pictures according to their horizontal separation on the ground glass, the criterion of their respective distances. This alteration of the convergence of the optic axes, according to the distance of the various planes, gives the same sensation of relief we obtain when we look at the natural objects, or at their photographic representations. The invention of Mr. Claudet, in our opinion, is calculated to produce a revolution in the application of the splendid discovery of Prof. Wheatstone to the exhibition of photographic pictures. At all events, it is one of the most curious facts connected with modern discoveries in optics,—deserving the attention of philosophers and the admiration of the public.

* *Query*, June 18th, 1857. See preceding Article, page 54.

*On a new Construction of Furnace, particularly applicable where Intense Heat is required.** By Mr. C. WILLIAM SIEMENS.

The high importance of the stores of combustible material which are distributed upon the surface of the earth, renders their wasteful expenditure and rapid diminution in quantity, in many parts, a serious subject for consideration; and, in the writer's opinion, there is no object more worthy of the earnest attention of engineers, and men of science generally, than that of causing the generation and application of heat to be conducted upon scientific and economical principles. Our knowledge of the nature of heat has been greatly advanced of late years by the investigation of Mr. J. P. Joule, of Manchester, and others; which have enabled us to appreciate correctly the theoretical equivalent of mechanical effect or power for a given expenditure of heat. We are enabled, by this new dynamic theory of heat, to tell, for instance, that in working an engine of the most approved description, we utilize at most only one-sixth to one-eighth part of the heat that is actually communicated to the boiler,—allowing the remainder to be washed away by a flood of cold water in the condenser. If we investigate the operations of melting and heating metals, and indeed any operation where intense heat is required, we find that a still larger proportion of heat is lost, amounting, in some cases, to more than 90 ℔ cent. of the total heat produced.

Impressed by these views, the writer has for many years devoted much attention to carrying out some conceptions of his own for obtaining the proper equivalent of effect from heat: some of the results he has obtained are known to the members of the Institution, amongst which are the regenerative steam engine and condenser, the regenenerative evaporator, and an apparatus for the economic production of ice. The regenerative principle appears to be of very great importance, and capable of almost universal application; and the object of the present paper is to describe an application of this principle to furnaces of every description.

The invention of the regenerative furnace is due to the writer's brother, Mr. Frederick Siemens; and it has been matured and variously applied by the writer within the last few months. The result has, in all cases, been a large saving in fuel over the plans in common use, amounting to from 70 to 80 ℔ cent. of the total quantity of fuel hitherto consumed. The apparatus employed is moreover of a very simple and permanent description, and combines economy of fuel with other advantages, amongst which are the total prevention of smoke, and a general improvement in the quality of the work produced.

The furnace consists of a heated chamber, and of two fire-places or solid hearths, communicating respectively with the two regenerators. Each regenerator consists of a series of walls of fire-brick, laid in open Flemish bond, in such a manner that the pigeon holes of each wall are opposite the solid parts of the succeeding wall; the object being to form a number of zigzag or tortuous passages through the regenerators, leading to opposite sides of a valve, at the bottom of the chimney.

*From Newton's London Journal, April, 1858.

This valve consists of a rectangular box of iron, open at the two sides to the two regenerators, at the bottom to the atmosphere, and at the top to the chimney. A spindle passes through the centre of the two remaining close sides of the box, and carries a rectangular flap, or movable plate, fitting the box sideways, and bearing against one of its upper and one of its lower edges, according to the position of a tumbling lever and weight, fixed upon the valve spindle. When the valve is in either of its two positions, the atmospheric air, entering from below, passes through one regenerator, then over the adjacent fire-place, through the heated chamber, over the second fire-place, through the second regenerator, and, by the back of the valve, into the chimney.

A fire having been lighted, say, on the right-hand hearth, through a side opening, the flame passes through the furnace and through the second regenerator, to the chimney. In its passage through this regenerator, the first perforated wall that the flame strikes against will be heated to a considerable degree, the second wall to a lower degree, and so on in succession; the heat of the current being thoroughly exhausted by the time it reaches the chimney.

After about one hour's work, the position of the valve is reversed, and fuel is supplied to the second fire-place, which is then acted upon by a current proceeding in the opposite direction to that described. The cold atmospheric air comes in contact first with the least heated wall of the second regenerator, and then with the more heated walls successively, acquiring thereby a degree of temperature approaching the temperature of the heated current which previously entered the same regenerator. The heat thus imparted to the fresh air, greatly increases the temperature of the flame, which is now being produced upon the second or left-hand hearth; and consequently the nearest end of the first regenerator will be heated also to an increased degree,—the current reaching the chimney comparatively cool.

When the valve is again reversed, the fresh air will be heated nearly to the increased temperature of the hot end of the first regenerator, and will produce a still hotter flame with the fuel supplied to the first hearth. It is evident that, by a continuation of this process, an accumulation of heat, to any degree, may be produced within the furnace; provided only, the heat produced in combustion is greater than the heat lost by radiation, and the heat absorbed by the metal or other substances in the heating chamber.

In the regenerating furnace now described, the temperature at which the heat is communicated to the materials does not affect the quantity of fuel requisite, except so far as increased radiation is concerned; for the products of combustion pass away in all cases at a temperature not above 200° or 300° Fahr. This new principle of furnace is therefore applicable, with the greatest advantage, in cases where intense heat is required. It has been applied to furnaces for re-heating steel and iron, at the works of Messrs. Marriott & Atkinson, at Sheffield. One of these furnaces, after nearly three months' constant work, showed a saving of 79 ℔ cent. effected over the old furnace, in heating the same quantity of metal. Mr. Atkinson has also applied this principle of fur-

nace for melting cast steel, and obtained a still larger saving, although the new melting furnace has not yet been rendered entirely satisfactory for the workman.

The regenerative furnace has also been applied to the purpose of puddling iron; and although the new puddling furnace has been completed and worked only for a few days, at the works of Messrs. Rushton & Eckersley, at Bolton, the writer is able to state that it converts a charge of 480 lbs. of pig metal into wrought iron, with an expenditure of only 160 lbs. of common coal, as compared with 6 cwt. required in the ordinary furnaces: the net yield of wrought iron is higher than that of the ordinary puddling furnace, and the quality of the iron produced seems also to be superior. It is also worth mentioning, that the chimney of this puddling furnace may be watched for hours, and no trace of smoke will be seen issuing from it.

Mr. Atkinson said he had been working a re-heating furnace, altered to the new plan described in the paper, at the Fitzalan Steel Works, near Sheffield, during the last two months, in juxtaposition with a corresponding ordinary furnace; both having been built originally at the same time, and doing the same description of work,—heating cast steel bars for rolling and tilting. He was so much surprised at the great difference in the consumption of fuel by the two furnaces, that he had a particular account kept of the consumption of both during the course of a week, and found the total consumption of each in the six days, was 7 tons in the ordinary furnace, and only $1\frac{1}{2}$ tons in the altered one,—the work done by each being practically the same, and all circumstances alike during the time of comparison. He had also made a trial of the new plan of furnace, for melting cast steel, and obtained an equally favorable result as to economy of fuel; rather less than 1 ton of coke was consumed per ton of steel melted, instead of $3\frac{1}{2}$ to $4\frac{1}{2}$ tons per ton of steel, as required in the ordinary melting furnaces.

Mr. McConnell was much struck with the beautiful principle involved in the new furnace, of making the currents of air circulate alternately in opposite directions, and thus effectually extracting the heat from the air, before it reached the chimney. He inquired whether it was found that the great alternation of temperature affected the durability of the brick-work, as the several portions were exposed to extreme variations of temperature; also, whether there was any difficulty in keeping the holes in the regenerator walls open and in repair, on account of the very high temperature to which they were exposed.

Mr. Atkinson replied, that he had not experienced any practical difficulty from that cause; but, on the contrary, he found an important saving in the cost of brick-work repairs: for in the ordinary furnaces, the chimney had to be lined with fire-brick to a considerable height, in consequence of the intense heat of the air entering the bottom of the chimney; but in the new furnace, the heat was so completely extracted before reaching the chimney, that he could bear his hand on the flue, within a foot of the valve, at the base of the chimney, that regulated the alternation of the current; and not a single fire-brick

was now used in the chimney. In the regenerator portion of the furnace, there was no sign of want of repair at present, nor of slag from the melting of the bricks, and they appeared likely to last three times as long as they had done at present.

Proc. Insti. Mech. Engineers, London.

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*Proceedings of the Royal Scottish Society of Arts.**

Jan. 25.—On an improved Stove for Heating Apartments, Greenhouses, &c. By JAMES STARK, M. D., who entered into its description, and stated that it consisted of a cylinder of sheet iron, with an inner casing of cast metal rising the height of the top of the door, and within which alone the fuel was burned. The whole fire-place for the coals was below the opening of the door, while the cylinder rose high above it, and terminated in a flat top, on which was placed an iron plate containing water. A flue provided with a damper passed off at the back of the stove, close under the flat top. The cast iron box containing the ash pan was made close, so that the quantity of air which was admitted to the fuel might be under perfect regulation. The special advantages of this form of stove were—the absence of the usual burnt smell which prevails in apartments heated by stoves; the capability of regulating with the greatest accuracy the temperature of the apartment; the ease with which the stove was heated; the great economy of fuel, as it only required common Scotch dross of any kind; its cheapness; and its non-liability to get out of order or require repairs. The kind of stove shown had been used for a period of three years; and the inventor stated that an 8 inch stove, 30 inches high, had kept an apartment, 18 feet by 14 feet and 13 feet high, at a temperature of 63° during all the days when a fire was requisite, and that the average amount of fuel consumed annually was 1½ tons of common Scotch dross, value about 7*s.* 6*d.* Dr. Stark made some further remarks on heating and ventilating apartments.

On Explosions of Carburetted Hydrogen in Coal Mines, with the points to which we may look for their radical cure. By HENRY CADELL, Esq., Grange, Bo'ness.—The apalling accidents which frequently occur, Mr. Cadell remarked, were subjects of much painful interest, and for a number of years have been inquired into by committees of both houses of parliament, but without any decided effect in remedying the evil. He stated that much ingenuity had been shown in the improvement of ventilation of mines, and many appliances were adopted for driving or drawing air through them, and from the evidence given before the committees it appears, that in many cases these might be said to be carried to the verge of their capability. The various safety lamps in use, the principal being that by Sir Humphrey Davy, had been the means of bringing into operation mines which without such appliances would have been altogether unworkable; but it is allowed that since the introduction of these, accidents by explosion had rather increased

* From the Lond. Civ. Eng. and Arch. Journ., April, 1858.

than diminished, and as there were many contingencies by which these lamps might be injured, or made to communicate the flame to the explosive mixture, there could be no safety from explosions so long as these lamps were in the hands of hundreds of workmen; and he considered the only preventive was by keeping the workings at all times so aired as to be far removed from the explosive point, reserving safety lamps for special use in heading rooms and levels going before the body of the workings. In order to effect this in many workings, one of two things is requisite to render the ventilation so far complete as to dispense with safety lamps in the regular workings—either more shafts must be sunk, or a system of working adopted which may effect the same object; and as the former is frequently a subject of much difficulty, it is to the latter that he directed particular attention. The general methods of working coal may be classed under three systems, diagrams of which he exhibited: viz. 1. The pillar and room working, where rooms or excavations of from 3 to 6 yards wide are cut, leaving pillars of the coal for the permanent support of the superincumbent strata. 2. The panel wall system, where narrow excavations or rooms are made, leaving large panel-shaped pillars, which are afterwards partially taken out; and—3. The long wall system, where the whole coal is taken away progressively, roads being formed by removing a part of the roof or pavement, the superincumbent strata in this case settling down gradually as the workings progress, leaving a clear space along the face of the coal. In the two first-named methods there is a great face of coal exposed for the giving out of carburetted hydrogen, while a large open area is left for the gases to accumulate; while in the latter, or long wall system, there is the smallest amount of coal face exposed, and from the strata settling down as the workings progress, there is the smallest space left for the accumulation of gases; and the air course being along the faces, which are nearly in a line, is short and direct as compared with the other modes of working. He believed that what had been said would meet with little direct opposition, and found that so far these views were corroborated by the testimony of different engineers, at least for the purposes of general ventilation, and instanced the evidence given before a committee of the House of Commons, by Mr. Wynne and Mr. Landale, and the opinion of Hedley, in his book on the ventilation of mines. The principal obstacles to the general introduction of this system are its alleged expense, and apparent difficulty in high and clean seams; but these are matters more in idea than in practice, as in some parts they have been successfully overcome; and when properly introduced, the long wall system has generally been found preferable to the other modes of working, and has gradually been gaining ground. He concluded by repeating that what is to be looked to for safety from explosions, is a ventilation sufficient to keep the workings at all times remote from the explosive point; and with this view, where they are fiery and extensive, either more shafts should be sunk, or a method of working adopted which shall render easier and thereby improve ventilation, and that such is to be found in the long wall system of working.

Feb. 8. *On an improved Method of Graduating Hydrometers.* By Prof. Elliot, Queen's College, Liverpool.—After describing the usual method of graduation by accurately determining two points on the scale and dividing the intermediate space into equal parts, Prof. Elliot pointed out the erroneousness of that method in principle, and the serious deviations from truth to which it is liable in practice. He then demonstrated the true character of the progression which ought to exist in the lengths of the successive divisions. Prof. Elliot then proposed a geometrical process; by which the graduation might be effected with strict accuracy; and showed how that process might be rendered extremely easy when the instruments are constructed in quantities to be sold at a low price.

Description of a Check-Grieve for Registering Coal Sales by means of Machinery. By William Johnstone, mineral manager, Carron Company, Falkirk.—This machine is intended to be a check on the coal sales, and will prevent any suspicion between the salesman and his employer. It is simple, and easily understood. It consists of a disk in front with numbers engraved on the outer edge, with a pointer which is connected to two typed wheels, which are enclosed within a cover, where only a small opening is left in the cover for the salesman to put the ticket he is about to stamp into one of the typed wheels; and when he prints the required number of hundredweights on the carter's ticket, the other typed wheel is at the same time registering the samo number of hundredweights on a strip of paper that the salesman has no access to, so that his employer can at any time compare the weight registered by the machine with the weight written in the sale books. The inventor stated that his machine by a slight alteration could be made to be useful in large drapery establishments, for receipting and registering the sale of goods.

Feb. 22.—*Improved Cottage Window Frame.* By Hon. Lord Murray. The object in view was to provide efficient ventilation without the several inconveniences of either the sash or the hinge principle, so often objected to as entailing much trouble or frequent repairs; and this is effected by making one-fourth of the window slide horizontally, in so simple a manner that while it allows perfect adjustment in quantity of opening, there is hardly any possibility of the arrangement getting out of order. The invention was exhibited in the shape of a wooden model, as well as of a full-sized cast iron window frame with sixteen small panes. The moulds being preserved at Shott's foundry in Leith-walk, further copies if required may be had.

On Photographical Illustrations for Books. By Professor C. Piazzi Smith.—After alluding to past attempts, attended with more or less success, to produce copies of photographs for publication, the author referred to the illustration of his recent work on "Teneriffe," published by Mr. Lovell Reeve, of London, as an example of a large impression of a book illustrated with pure photographs. The requisite number of copies had been procured by adopting the principle of printing from *secondary* negatives, so that several printers could be employed at once. Further advantage had followed from this method, for the second

negatives gave pictures of far more intensity than the first; and in one instance the original picture had been an opaque positive, backed up with black varnish; and as such generally supposed incapable of being multiplied. Its repetitions, however, produced by a process which the author described at length, from Plate 18 of the book. If any further difficulty occurred in supplying the public with copies of the work as fast as they were ordered, it arose chiefly in getting experienced mounters, each photograph having to be pasted on a plate card, and each book having forty such mountings. This delay and trouble must yield in time, if the public approve of photographic illustrations; and in such case a new field will be opened up to employ the ill-paid class of seamstresses in large towns.

Registering Frame for Printing Chromo-Lithographic Plates. By R. Burn, Engineer, Edinburgh.—This improvement consists in the construction of the hinges, which are made in such a way as to provide against any injury being sustained by them from the pressure put upon the lithographic press when the carriage is passing the scraper-bar; registering machines having hitherto been constructed with hinges quite flat on both sides; whereas, Mr. Burn's frame would, on examination, be found to have the bottom part tapered, and so constructed that any amount of pressure to which it may have to be frequently subjected will leave it uninjured.

March 8.—An experiment showing the *Contraction of Water above the Freezing Point.* The water operated on was contained in a glass jar, about 4 inches in diameter and 18 inches high; and the changes in its density were shown by the ascent and descent of colored glass balls about an inch in diameter. When the water was ice cold the balls were all at the bottom; but gradually, as the warmth of the room was communicated to the water, its contraction and consequent increase of density caused the balls to rise. As the water approached the state of greatest density, the heavier balls were seen to move irregularly about, in consequence of the current caused by the changes of temperature. In the course of an hour, the point of maximum density having been passed, the balls began to descend in reverse order, and at last all again reached the bottom. Mr. Sang added, that although he had never seen any published description of this experiment, he could scarcely expect it to be new, seeing that it is an obvious extension of a well-known method for demonstrating the compressibility of water.

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*The Production of Aluminium.**

M. Petitjean, a French chemist, resident in London (the inventor of an admirable method of silvering mirrors cheaply, which was brought to the notice of the Royal Institution some time since by Professor Faraday), has effected an improvement in the production of aluminium, which promises to still further reduce the cost of that valuable metal beyond all that has hitherto been anticipated. His invention consists in trasforming so much of the aluminium as is present in the substances with which it is found naturally combined into one or more sulphu-

* From the Mechanics' Magazine, March, 1858.

rets; and then removing the sulphur therefrom by the aid of carbon, or a hydro-carbon, or of a suitable metal or metals, mixed therewith, and exposed in a crucible to a high temperature, after which the aluminium in a metallic state will be deposited in the crucible. The process is equally applicable to the production of magnesium.

Study of the Thermo-multiplier. By M. F. DE LA PROVOSTAYE.

This instrument, valuable to the experimentalist for its extreme delicacy and for its extensive scale, has been the object of careful theoretic and practical study by M. de la Provostaye, whose results as reported to the Academy of Sciences at Paris, may be summed up as follows: First, as to the galvanometer.

1. Whatever may be the position of the needles, the forces which act upon each half are reducible practically to one, perpendicular to the plane of the meridian.
2. That the amount of deviation makes but a slight change in the amount of this resultant: hence, the apparatus may be regarded as a tangent-needle of a very considerable degree of perfection.

Secondly, as to the thermo-electric pile.

1. The progress of heating the thermometer takes place by the same degrees and in the same time, as if it were placed in a space at the constant temperature which the pile attains under the influence of the source of heat.
2. When the rise of the temperature is sufficiently small, if we withdraw the calorific action, it cools again in the same time and by the same degrees as if heated.

Thirdly. He determines the integral expression for the movement of the needle; shows that its position of rest under the action of the current is proportioned to the constant quantity of the current when the anterior face of the pile has assumed a stationary excess of temperature, and to the intensity of the incident heat: and then derives expressions for the times corresponding to the maximum and minimum excursions of the needle, and the extent of these excursions; and terminates with the following observation: "If, after making an observation with the thermo-pile in the common way, and awaiting the fixed deviation of the needle, the screen is replaced, the energy of the current diminishes and the needle returns to zero. I have found that the retrograde motion of the needle, counted from the fixed deviation, takes place by oscillations of the same extent and times as the primitive motion counted from zero.

Wooden Church, Paris.

The novelty of a Gothic church, all constructed of white wood, steeped in some antiseptic preparation to render the timber incorruptible, can now be seen near the Boulevard Mont Parnasse, at the Caen and Nantes station. Its best recommendation is its wonderful economy. "Notre Dame des Champs" will be inaugurated next Sunday.—*Globe Paris Correspondent.*

*Researches upon Cochineal.** By M. Schutzenberger.

Manufacturers of printed cottons have long known that cochinea when left for several days in contact with an aqueous solution of ammonia, undergoes an interesting modification which has not yet attracted the attention of chemists. The red coloring matter (carminic acid) passes to the state of a matter of a fine violet color, which acids do not modify, or cause to become red. This body cannot, therefore, be regarded as carminate of ammonia. To ascertain the transformation that takes place, I analyzed some carminic acid, upon the purification of which I had bestowed the greatest care, and modified this acid by means of ammonia. By the comparison of the two results obtained, I found that the coloring matter of the ammoniacal cochineal was the amide of carminic acid. On analyzing carminic acids prepared by different processes, I found that each had a different composition, but all my analyses might be definitively represented by the same formula with more or less oxygen, and I concluded therefrom that there exists at least two degrees of oxidation of carminic acid. I have in fact succeeded, by employing ether mixed with more or less alcohol as a solvent, in separating and obtaining in a crystalline form two products, of which one is represented by the formula

$$C^{18}\,H^{8}\,O^{10},$$

and the other by

$$C^{18}\,H^{8}\,O^{14},$$

as well as two intermediate degrees of oxidation, one

$$C^{18}\,H^{8}\,O^{12},$$

the other

$$C^{18}\,H^{8}\,O^{13},$$

which may be regarded either as peculiar bodies, or as compounds of the more oxidized with the less oxidized acid. By heating a mixture of carminate of soda and iodide of æthyle to 257° F. in a closed tube, I have obtained the ethers of these carminic acids in the form of red bodies, insoluble in water, but soluble in alcohol.

I have also remarked that nascent hydrogen completely decolorizes a solution of carminic acid, and that the color returns in the air. This reaction may be compared with that which takes place when indigo is reduced.—*Comptes Rendus*, January 4, 1858, p. 47.

* From the London Chemical Gazette, No. 368.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, June 17, 1858.

John C. Cresson, President, in the chair.

John Agnew, Vice-President.
John F. Frazer, Treasurer.
Isaac B. Garrigues, Recording Secretary. } Present.

The minutes of the last meeting were read and approved.

Letters were read from the K. K. Geologischen Reischsanstalt; Vienna, Austria, and the Royal Geographical Society, London.

Donations to the Library were received from the K. K. Geologischen Reischsanstalt, Vienna, Austria; the Royal Geographical Society, the Royal Institution, and the Royal Astronomical Society, London; La Société d'Encouragement pour l'Industrie Nationale, and L'Ecole des Mines, Paris, France; Major William H. Emory, U. S. Army; the O'Fallon Polytechnic Institute, and the Academy of Science, St. Louis, Missouri; Dr. B. H. Rand, William J. Young, Esq., and Prof. John F. Frazer, Philadelphia.

Donations to the Cabinets were received from John P. Whipple, Chief Engineer, U. S. Navy, and Dr. Charles M. Cresson, Philada.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement of the receipts and payments for the month of May.

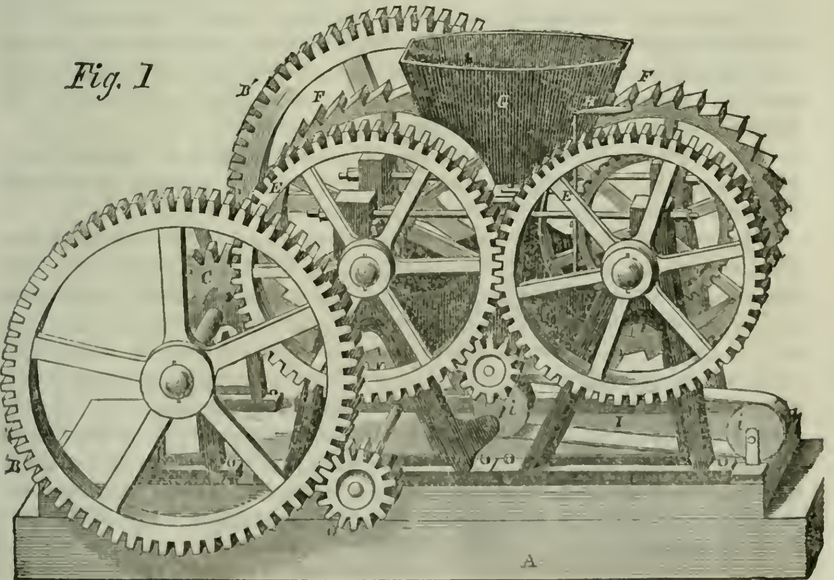
The Board of Managers and Standing Committees reported their minutes.

The Board of Managers reported, that at their last meeting they elected Lieut. Col. James D. Graham, U. S. Topographical Engineer, a corresponding member of the Institute.

Candidates for membership in the Institute (4) were proposed, and the candidates (6) proposed at the last meeting were duly elected.

W. Jones exhibited Wagner & Harper's Brick Machine, the invention of I. Z. A. Wagner, of Philadelphia, of which the cuts are an illus-

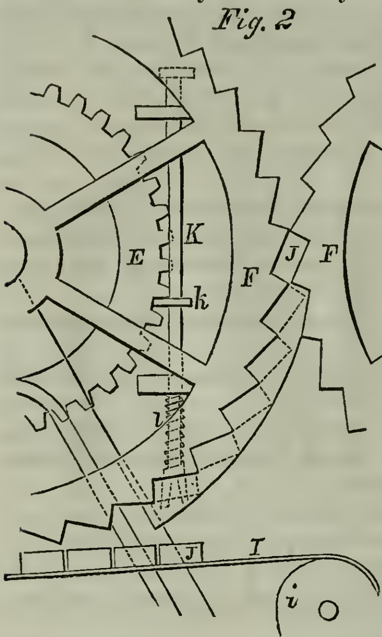
Fig. 1



tration. It consists of two mould-wheels, F F, with serrated faces,

working in journals, and rotating at the same speed by means of the coupling wheels, EE. The indentations of the mould-wheels come opposite each other as they successively fall in the lines joining the axles of said wheels, and form a rectangular box, as shown at J, of the brick size. A hopper G, fits over and on the sides of the mould-wheels, into which is fed the clay in its natural untempered condition; its gravity causes it to fall into the space between the wheels, which, in their rotation, compresses it, expelling the air, and by their continuous movement, carry the formed brick down towards an endless belt I, running over two pulleys, *ii*, driven by gearing. Upon this belt the bricks are delivered, their adhesion to the moulds being broken by the action of the apparatus K, worked by the tappets of the wheel E, striking upon the trigger K. *l* is a spring to elevate the rod after each depression. B, B′, C, D, are gear wheels; A is the timber foundation. Strong brace bolts *t t*, pass from side to side of the frame close to the journal boxes, to prevent any spreading between them. This machine is simpler than many others used for making bricks from dry clay, as no plungers or stampers are employed; and a higher rate of speed can be admitted without danger, the limit being the rapidity with which the attendants can remove the moulded bricks.

Fig. 2



Also, Mr. C. M. Cresson's Gauge Cocks, designed for boilers using muddy water, and arranged so that they can be ground in without removal from the boiler while under a pressure of steam.

They may be described thus: the shell or case is of the usual shape, with a globular extremity, the shank being drilled longitudinally with the escape holes at right angles in the globe end. A crank handle has a screwed spindle, which works in an internal thread cut in the globe end of the cock; through this spindle, is drilled a hole in which the stem of the valve or plug works, its inner end bearing against a shoulder; consequently, when the handle is turned either way, the valve is forced into its seat, or permitted to open for the passage of the steam or water. A milled head secured upon the outer extremity of the spindle, enables it to be turned upon the seat when required to be ground in.

Mr. Henry Bowers exhibited a red dyeing material obtained by him from coal tar.

COMMITTEE ON SCIENCE AND THE ARTS.

The Committee on Science and the Arts constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination, "an Adjustable Eccentric for Operating Slide Valves of Steam Engines," invented by Mr. S. Lloyd Wiegand, of Philadelphia, Pennsylvania,

Report:—That it consists of a strap and eccentric block of the usual form mounted upon a sleeve, fitted with two feathers on opposite sides and in line with each other, but at an angle with centre line of sleeve and main shaft. Suitable gear is attached to the sleeve to move it endways upon the shaft, (with which it rotates,) and to hold it at any required point of its travel. The eccentric block fits snugly upon the feathers, but does not touch the sleeve at any point, the centre hole or eye being made oval to clear the sleeve as it approaches the latter, by sliding upon the inclined feathers.

The eccentric does not move sideways with the sleeve, but is kept in place by guards on each side, or by a cross bar passing through the shaft and having its ends secured to the eccentric block. In the latter plan, the sleeve is slotted to permit its motion by the bar. The eccentric block is so made that its throw is equal to the lap of the slide valve, and when mounted, and midway upon the sleeve, its centre falls in a plane passing through the centres of the sleeve, the feathers, and also, when the valve gear is direct acting, through the centre line of crank.

The throw necessary to give the required travel to the valve, is had by moving the sleeve through the eccentric, causing it to move up the inclined feathers, and thereby increase its centre from the centre of rotation, thus an amount of steam opening ranging from nothing to full open can be obtained.

From this, and the accompanying description and drawings, it will be seen that when the sleeve is shifted either way, the centre of the eccentric moves in a line at right angles to this plane, consequently, the lead of the valve is constant, or nearly so, a slight variation occurring from the obliquity of the eccentric rod, but it is exactly equal for each two opposite points equidistant from the plane; therefore, an engine fitted with this gear will run either ahead or back, as the eccentric is disposed, and the steam can be cut off at any point of the stroke.

In comparing this valve gear with others intended to accomplish the same purpose, the committee consider its merits equal to the best known to them, and that it performs the same functions with fewer parts and wearing surfaces. The committee are aware that a design similar to this was patented in Great Britain, (see Isaac Dodd's specification, No. 2605, British Patents for 1854,) but it was defective in not giving lead in backing, an important feature believed to be peculiar to this now under consideration.

From the amount of space necessary to get the motion of the sleeve, the committee think this plan will not be applicable to all forms of marine engines, but on locomotive engines, where the entire space on the

axle between the cranks or the journals can be appropriated, it is well suited, and it is recommended to the favorable notice of locomotive manufacturers.

By order of the Committee,

Philadelphia, May 13th, 1858. Wm. Hamilton, *Actuary.*

Description by S. Lloyd Wiegand.

A pair of clamps, FF, are secured upon the shaft A, by means of the bolts and nuts GG; forged in the same pieces with the clamps are projecting guides, EE, which project radially from the clamps, and are finished with their sides perfectly parallel. The eccentric, B, has cast upon its sides four projections, O, O, O, O, which fit upon each side of the guides EE; a plate, II, is secured by bolts, II, across each of the guides, so that the eccentric can slide transversely across the shaft, the hole in the eccentric being of such a size and form as to permit it. Between the bolts GG, and the shaft A, are two slides CC, made concave upon one side so as to adapt them to the form of the shaft, and upon the other side of slides CC, are fixed oblique feathers DD, which are parallel to each other, and fit in correspondingly oblique grooves in the eccentric. The slides CC, are firmly attached to a collar J, by which they may be made to slide lengthwise of the shaft, and in so doing,

Fig. 1.

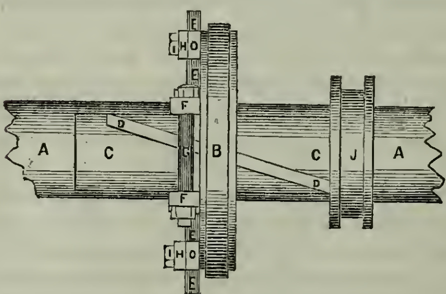
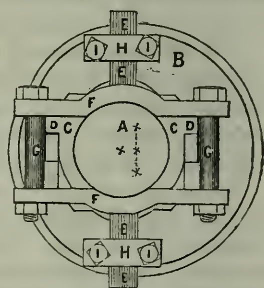


Fig. 2.



shift the eccentric across the shaft, and thus to give motion to the slide-valve of a locomotive engine, for either a backward or a forward motion, or any intermediate extent of motion of the valve, so that the slide-valve performs the functions of a cut-off valve, in the same manner as when operated by the shifting link motion of Stephenson. The eccentric, it will be perceived by reference to fig. 2, has the opening through which the shaft passes, made to one side of the centre, so that it is permanently eccentric in a direction at right angles to that in which its throw is varied; the dark cross represents the centre of the shaft, and the dotted line indicates the direction in which the centre of the eccentric moves when the throw is varied or reversed.

This permanent eccentricity is requisite to move the slide-valve to such a position, that it shall supply steam promptly at the commencement of each stroke of the piston, and toward the completion of each stroke it has the effect of cutting off the steam, by bringing the lip of the slide-valve over the steam port.

The relative positions which the centre of the eccentric assumes to the centre of the shaft and the line of the crank, may be seen in fig. 4; L is the shaft centre, LM the centre line of the crank, K is the centre of the eccentric when the valve has its full travel in forward motion, K′ is the eccentric centre when the valve has its full travel in backward motion, N is the position of the eccentric when in mid-gear, or set for neither forward or backward motion; when in this position the valve has a motion just sufficient to bring the edge of the valve to the edge of the steam port, but not sufficient to pass any steam into the cylinder. The distance between L and N is equal to the lap of the slide-valve, that is, the amount that the valve-lip exceeds the width of the steam port, assuming that the valve-rod is connected without the intervention of a rocker to the eccentric; when a rocker is used, the proportion of LN and KK′ must be varied according to the relative length of the rocker arms. The extent and direction of the throw of the eccentric can be

Fig. 3.

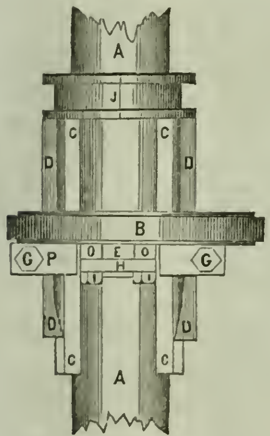
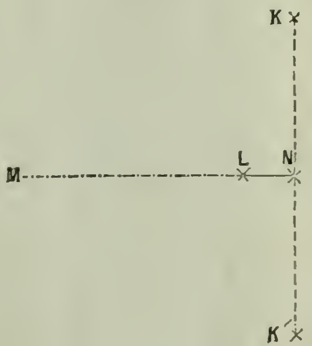


Fig. 4.



controlled by the engineer operating a lever which slides the collar J lengthwise of the shaft, while the engine is in motion or at rest, and a variable expansion is thus effected.

The slides of the eccentrics of both engines of a locomotive being both attached to one collar, are operated simultaneously by the engineer.

The advantages possessed by the arrangement are:

1st. That it is lighter than any other variable expansion gear.

2d. That it is simpler than any other.

3d. It gives steam more accurately than a shifting link-gear, by avoiding any angular variation, caused by the rising and falling of the eccentric rods.

4th. It is cheaper to construct than any other valve motion.

5th. Wear in any of its wearing parts can be compensated for by merely tightening the joints, without replacing any of the parts.

6th. It occupies less space than any other variable expansion gear, so that the boiler can be set lower, and the arrangement of the other parts of an engine varied to an extent inadmissible where the shifting link-gear is employed.

Abstract of Meteorological Observations for April 1858; made in Philadelphia, Northampton, Somerset, Bedford, and Huntingdon Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.

April, 1858.	Barometer. Mean.	Barometer. Mean daily range.	Thermometer. Mean.	Thermometer. Daily oscillation.	Thermometer. Mean daily range.	Relative humidity. 2 P.M.	Force of vapor. 2 P.M.	Rain.	Prevail'g winds.
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	
1	30·015	·040	50·8	24	1·7	25	·149		E S E.
2	29·871	·143	53·2	19	3·7	51	·283		N E.
3	29·720	·151	61·3	23	8·2	40	·310		N E.
4	29·780	059	56 5	20	5·5	32	·240		N E.
5	29·728	·066	56·8	16	5·7	46	·302	0·033	S E.
☽ 6	29·777	·101	48·5	14	11·7	38	·139		N W.
7	30·001	·224	45·0	21	6·8	23	·089		N W.
8	29·993	·042	44·8	8	4·5	61	·191	0·025	S E.
9	29·639	·354	61·3	29	16·5	62	.488	0·553	S W.
10	29·706	·118	65·5	22	8 5	28	·258		(var.)
11	29 807	·110	44·0	16	21·5	61	·182	0·455	N E.
12	29·673	·134	43·0	5	1·0	92	·265	1·242 (bracketed)	N E.
● 13	29·411	·263	49·3	16	6 3	90	·368		N E.
14	29·377	·085	54·7	18	5·3	62	·371	1·077	(var.)
15	29·540	·163	54 7	13	2·7	49	·255		N W.
16	29·667	·127	50·8	11	3·8	86	·348	0·058	S W.
17	29·792	·125	55·8	23	7·0	31	·195		WSW.
18	29·968	·176	54·7	16	2·8	40	·215	0·130 (bracketed)	N E.
19	29·986	·051	50·7	6	5·3	66	·257		N E.
☾ 20	29·687	·303	45·7	3	5·0	84	·262	0 730	N E.
21	29·505	·315	55·3	18	9·7	51	·283	0·018	(var.)
22	29·783	·278	57·2	20	3·2	29	·188		S.
23	29·569	·214	61·0	23	6·5	62	·488	0·288	S E.
24	29·788	·220	47·8	18	13·2	38	·162		W.
25	29·936	·148	41·2	8	6·7	56	·162		W.
26	29·975	·039	44·0	21	5·5	33	·125		N W.
○ 27	29·833	·141	41·8	12	3·8	33	·102		N E.
28	29·770	·063	51·7	21	9·8	24	·126		W.
29	29·723	·047	57·7	27	6 6	33	·216	0·072	W.
30	29·519	·204	70·7	29	13·0	37	·432		S W.
Means	29·751	·156	52·5	17	7·0	49	·248	4·681	N 3¼° E.

EASTON, Northampton Co.—Lat. 40° 43′ N. Lon. 75° 16′ W. Height above the sea about 340 feet. SELDEN J. COFFIN, Observer.

April, 1858.	Bar. Mean.	Ther. Mean.	Relative humidity. 2 P.M.	Force of vapor. 2 P.M.	Rain.	Prevail'g winds.
	Inch.	°	p. c.	Inch.	Inch.	
1	29·650	45·7	22	·115		S E.
2	29·540	50·2	43	·225		S E.
3	29·363	54·3	30	·194		(var.)
4	29·443		42	·209		S E.
5	29·343	52·0	45	·275	0·05	(var.)
☽ 6	29·437	40·7	36	·100		N W.
7	29·633					N W.
8	29·653	40·0	50	·148	0·54 (bracketed)	S.
9	29·270	52·5	80	·427		(var.)
10	29·377	55·8	34	·220		W.
11	29·490	39·3	58	·151	1·35 (bracketed)	(var.)
12	29·347	38·7	91	·225		E S E.
● 13			91	·208		E.
14	28·977	51·7	54	·283	0·03	S.
15	29·150	49·7	43	·181		W.
16	29·297	47·3	67	·249		W.
17	29·427	49·3	19	·097		W.
18	29·620	50·3	29	·146	0·64 (bracketed)	W.
19	29·690					N E.
☾ 20	29·377		87	·223		(var.)
21	29·120					N W.
22	29·413	52·0	54	·333		(var.)
23	29·240	54·5	50	·312	0·33	W.
24	29·420	39·5	54	·169		N W.
25	29 573	38·0	37	·118		W.
26	29·627	37·2	23	·066		N.
○ 27	29·470	39·7	21	·063		N W.
28	29·407	43 3	14	·055		(var.)
29	29·356	52·0	33	·165	0·18	W.
30	29·143	65·0	49	·422		W.
Means	29·419	46·9	47	·199	3·12	N 80° W.

SOMERSET, Somerset Co.—Lat. 40° N., Lon. 79° 3′ W. GEO. MOWRY, Observer.

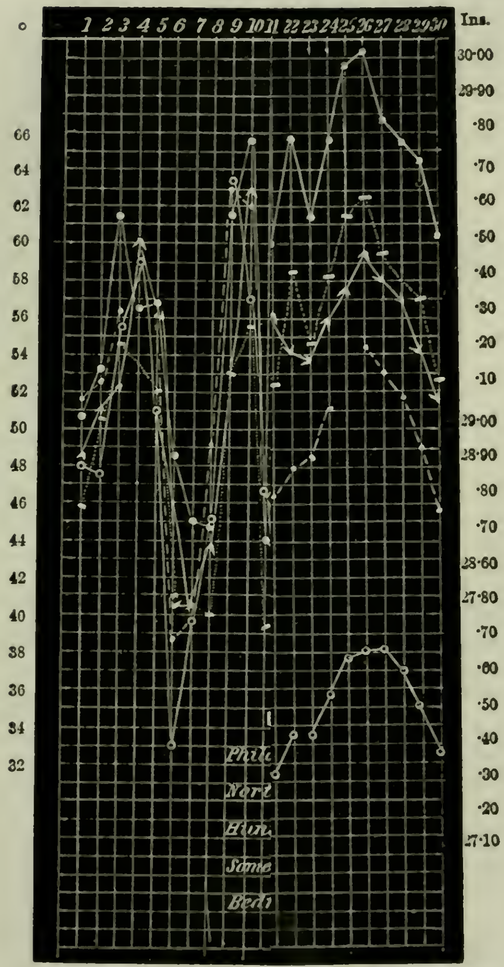
April, 1858.	Bar. Mean.	Ther. Mean.	Rain.	Prevail'g winds
	Inch.	°	Inch.	
1	27·704	48·0		S.
2	27·673	47·7		(var.)
3	27·546	55 3		S.
4	27·532	59·0	0·448	S.
5	27·570	51 0		WSW.
☽ 6	27·696	33·3		W.
7	27·812	39·7		(var.)
8	27·642	45·0	0·146	S.
9	27·449	63·3	0·301	(var.)
10	27·607	57·0		W.
11	27·529	46·3	1·335 (bracketed)	S S E.
12	27·361	38·7		S E.
● 13	27·178	47·7	0·054	S W.
14	27·205	43·3	0·106	W.
15	27·391	40·7	0·180	W.
16	27·525	45·0	0·081	W.
17	27·645	46·7		W.
18	27·716	45·0	0·221	(var.)
19	27·723	47·0		(var.)
☾ 20	27·398	50·7	0·672 (bracketed)	(var.)
21	27·368	51·7		W.
22	27·480	57·3		S.
23	27·485	47·3		W.
24	27·592	37·3	0·030	W.
25	27 684	37·7		(var.)
26	27·706	36·3		N W.
○ 27	27·710	37·0		N W.
28	27·675	42 3	0·036	(var.)
29	27·553	51·3	0·137	S W.
30	27·438	63·0	0·212	WSW.
Means	27·553	47·1	3·959	

BEDFORD, Bedford Co. SAMUEL BROWN, Observer. — HUNTINGDON, Huntingdon County. JACOB MILLER, Obsr.

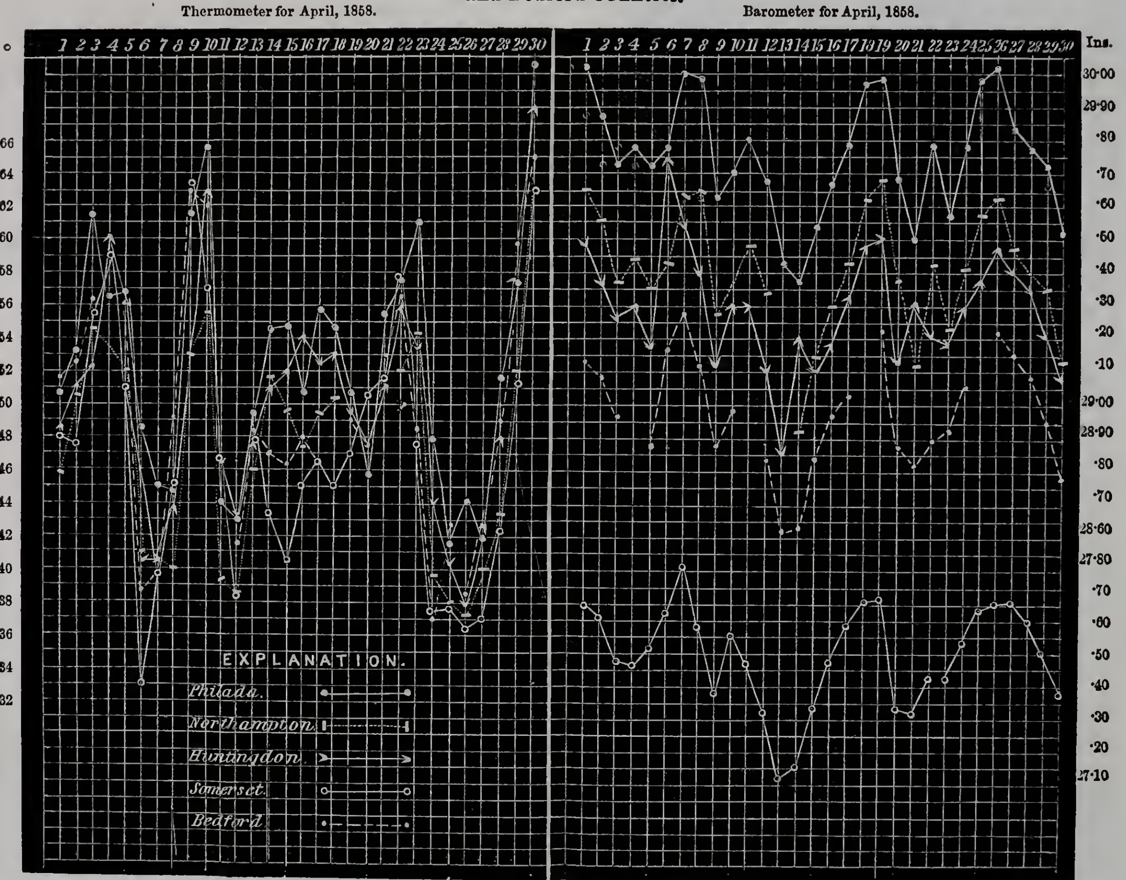
April, 1858.	Bedford Bar. Mean.	Bedford Ther. Mean.	Bedford Prevail'g winds.	Huntingdon Ther. Mean.	Huntingdon Rain.	Huntingdon Prevail'g winds.
	Inch.	°		°	Inch.	
1	29·147	51·3	S E.	48·3		S.
2	29·092	52·7	S E.	51·0		E
3	28·966	56·3	N W.	52 3		(var.)
4				60·0	0·404	S.
5	28·898	56·0	S W.	55·7		W.
☽ 6	29·161	38·7	N W.	40·7		N W.
7	29·279	39·7	N W.	40·7	0·034	N.
8	29·116	47·3	S E.	43·7	0·388	S.
9	28·874	63·0	S W.	62·3		W.
10	28·998	62·0	S W.	62·7	0·251	N
11				46·3	0·960	E.
12	28·843	41·3	S E.	43·0	0·266	E.
● 13	28·612	48·7	(var.)	47·3	0·155	E.
14	28·637	47·0	S W.	51·0		E.
15	28·846	46·3	N W.	52 0		W.
16	28·960	48·0	N W.	54·0		N W.
17	29 677	46·7	S W.	52·3		W.
18				52·7	0·139	S.
19	29·213	49·0	S W.	49·3	0·131	E.
☾ 20	28·871	47·3	S E.	47·7	0·468	S E.
21	28·811	53·0	N W.	52·0		W.
22	28·903	56·3	S E.	55·7		S.
23	28·930	48·3	N W.	53 7		W.
24	29·058	37·0	N W	44·0		W.
25				40·3		N.
26	29·213	38·3	N W.	38·0		N.
○ 27	29·150	41·3	N W.	42·7		N.
28	29·085	49·0	N W.	47 4		W.
29	28·951	59·7	S W.	57·3	0·057	W.
30	28·793	64·3	W.	67·3	0·145	W.
Means				50·4	3·398	

Comparison of the ›rset, Huntingdon,

Therm



Comparison of the Thermometric and Barometric Means of Philada., Northampton, Somerset, Huntingdon, and Bedford Counties.



JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

AUGUST, 1858.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

The Formation of Bars in Rivers and Harbors. By D. S. Howard, C. and M. Engineer.

As a general rule, bars are formed only by eddies. The formation of bars in the straight part of rivers usually commences in shoal places, where an upward direction is given to the water in its passage from a deeper portion of the channel, and the nature of the banks is of such material as to give way before the tendency of the water to spread, in accommodating the width to the required discharge with a diminished velocity and depth. The motion of the water in such places, particularly near the bottom, having a direction upwards forms a vertical eddy, depositing whatever comes down the stream having a relative weight sufficient to overcome the diminished force of the water, from the action produced by the form of the bottom, forming a bar more or less compact, according to the nature of the material deposited.

It is generally supposed, that where a bar has once formed, if removed, it will form again, but if the cause be removed by excavating, where the bar is as deep as it is immediately above, making the bottom uniform, there must some other cause intervene before another bar can be formed in that place.

Horizontal eddies form projecting points from the shores of rivers by virtue of a similar law, which diminishes the force of a current in proportion to the obstruction that diverts it from a right line, thereby crowding the thread of the stream towards the opposite bank from

where the eddy was first formed, which wears away and furnishes material for the deposits below, a part of which is transferred by the eddy mentioned to increase the point, until the current comes in contact with a resisting material, and becomes contracted sufficiently to create a current with power to prevent any further deposit on the point, when the place of deposit will have been gradually transferred to the centre of the eddy, where an island will eventually be formed; or if the current should not come in contact with any resisting material it would continue to wear away the bank in the same direction, and returning in a circuitous route to the original bed of the stream below, until the natural descent of the stream was so far overcome by the relative distance of the new circuitous route as to weaken the current sufficiently to render it harmless. (Such is the law that guides the Mississippi and many other streams with yielding banks.) Then, if there be water enough for the purposes of navigation at all times, and the regimen of the river fixed, there would be no more trouble, but as the regimen of a river cannot become fixed unless measures have been taken to keep back the freshets common to all streams, we must expect that at a different level from the most usual flow of the stream, the current will come in contact with other obstructions projecting from one side or the other, forming new eddies and other deposits, changing materially, perhaps, the course of current and width of the stream, plainly showing that no river can have a fixed regimen, until the freshets are in some measure under our control.

With sufficient reservoirs at the head waters of a stream to control the freshets, we have not only improved the river permanently for the purpose of navigation, and the country with water power, and the facilities for irrigation, but if the stream extends to the sea coast, the harbor at the mouth is also permanently benefited by the absence of the material for deposits usually brought down in large quantities by freshets, forming bars wherever the shape of the bottom or sides of the harbor or pass, afford a sufficient obstruction to a straight course of the current.

There is a popular fallacy in the common observation that bars in the tide waters of rivers are formed by the meeting of the tide with the current of the river; without thinking that there is no point within the range of the tide from the mouth of the river up, where the two currents do not meet at some stage of the tide, such observations pass current. Bars are formed at the meeting of currents, but it is where they continue to meet for some length of time, forming eddies either vertical or horizontal, or both, but when the tide and river meet, the force of the stream is overcome by the tide, and both pass up together with less and less force, until it becomes infinitely less and less, when the *backwater* will be found to have extended far above the change of current, and accumulated sufficient force to overpower the exhausted tide, which it accompanies with increased power back to the sea, distributing their deposit wherever the contour of the bottom or sides of the stream favor the formation of eddies, and at no other places.

When deposits are made in still water, they are in the form of flats, and are generally a long time in forming, but whenever short shoals obstruct the navigation of a stream, they will be found on examination, to be either an original formation, or a bar formed in accordance with the above mentioned laws, that is, from some irregularity in the bottom or sides of the stream above, causing eddies either horizontal or vertical, or both. Bars are sometimes formed by the action of currents produced by winds and waves at the mouths of rivers and entrances to harbors, which seems to clash with "the most commonly received theory," according to Mr. Mahan, which is, "that a wave is a simple oscillation of the water, in which each particle rises and falls in a vertical line, a certain distance during each oscillation, without receiving any motion of translation in a horizontal direction." Without going into an investigation of the whole conduct of waves, we may assume here, from common observation, that water does receive an impulse from the wind in a horizontal direction sufficient to move not only sand, but stones weighing a ton or more, which have been thrown over the pier at Oswego, on Lake Ontario, State of New York, four or five feet high above the water by the action of the wind and waves.

Any one who will observe the effects of the wind blowing parallel to the bank of a sea, will see the waves gradually change their direction as they approach the shore, as if the wind were blowing towards the beach, plainly indicating a motion of the water in the direction of the wind, and at a distance from the shore to be greater than at the shore, on account of the resistance offered by the inequalities of the beach. It will also be observed, if the material composing the beach be movable, that it will be shifted more or less in the direction of the wind, and formed into small projections in the shape of horizontal waves.

It is evident from such observations, that if a wind prevail parallel with the sea coast where the mouth of a river or a pass into a bay or harbor be situated, and if there be a movable material on the coast sufficiently heavy to sink in salt water, there will be a tendency to form a bar from the windward side of the channel, in the direction indicated by the force of the outward current, and the power of the waves, the relative force of the waves increasing as the bar proceeds outward, and that of the outward current diminishing as it expands, causing the bar to bend to the opposite bank in the form of a segment.

The laws which govern the formation of bars when known are very simple, but the circumstances that attend their action are varied in the extreme; therefore a true knowledge of the subject requires long and patient experience, strict and mature observations, and well digested deductions, untrammeled by favorite ready-made theories, which are always fatal to just conclusions from extensive and varied premises. Less perfection in knowledge of the subject, however, will show that bars are always formed by eddies, but eddies do not always form bars, for the reason that a material suited in texture and weight to the velocity of the eddy is always necessary. If the material be too fine or too light for the power of the eddy, it will be kept in motion until some

slight change in the force or direction of the current causes it to pass off in tangents, when it finds its way into some less turbulent eddy, calculated to give it rest.

The material for bars is often wholly absent where eddies prevail, which directs our attention towards a more remote cause of their formation, the furnishing of the material. This is done most extensively and almost wholly by freshets; the principal precaution, then, is a control over the head waters of the rivers by means of reservoirs, which will not only prevent the obstruction of navigation, but the destruction of an immense amount of property. We have now only to take a trip on the Mississippi to realize the wisdom of Mr. Ellet's plan of improving the Ohio River, which, if it had been done accordingly, it would be easy to see without an estimate, the inconsiderable sum it would have cost, compared with the expense of dykes, crevasses, and the property destroyed by the present freshet on the Mississippi, which would have been effectually prevented by the improvement of the Ohio alone.

Corpus Christi, Texas, April 30, 1858.

Sliding Friction. Diminution of Sliding Friction as the velocity increases, particularly in the Friction of Cars on Rails: Formula which represents this Diminution. By M. H. Bochet.

The excellent experiments of M. Morin (performed at Metz in 1831 and 1833,) upon sliding friction, placed beyond all doubt the law previously announced by Coulomb, that within the limits and in the conditions of these experiments, the sliding friction was independent of the velocity and of the extent of surface, and varied only with the pressure and the nature and condition of the surfaces in contact. So that this friction could be represented by the formula $f = p\,\text{K}$. Where p is the pressure upon the surfaces, and K a coefficient, the value of which depends on the nature and condition of the surfaces. But in these experiments, the velocities varied only from 0 to 3 metres per second, and in the experiments of Coulomb it was still less. It might then be doubted whether, under very different conditions, (for instance, in case the velocities should vary from 0 to 25 metres per second, as happens on railroads, when the trains are checked and some of the wheels slide over the rails, and in many other cases,) the same law would continue to govern the friction.

The precise coefficient in the peculiar case of the sliding of car-wheels over the rails was also to be determined in the various conditions of the rails.

New experiments instituted for this purpose in 1851, by M. J. Poirée, showed, that at least in the case of the friction on railroads, and for velocities varying from 4 to 22 metres per second, the friction diminished as the velocity increased.

Again, M. Nap. Garella, and the author of this Memoir, made, in

1856, experiments on the stopping of trains upon railroads, the results of which led to the same conclusion. And again, the same fact is developed by the experiments on the stopping of cars by the shoe-brake, made by M. Poirée in 1856.

The author sought to discover the precise law, and the formula which would represent the variation of the friction with the velocity, at least in the particular case of railroads, and he thinks that he has succeeded, by the graphic mode and by a series of deductions, in showing that this variation may be represented by the formula $f = \frac{p\,\text{K}}{1 + a\,v}$: where f represents the intensity of the friction; p, the pressure on the rails; K, a coefficient depending entirely on the condition of the rails, (the tires of the wheels, and surfaces of the brakes, being of wrought iron like the rails.) (This coefficient is to be taken $= 0{\cdot}3$, when the rails are at their maximum dryness: 0·25 when they are very dry: 0·2 when dry: 0·14 when they are wet.) v is the velocity: and a is a coefficient whose value depends principally upon the manner in which the sliding takes place, (whether direct, that is, the wheels sliding over the rails, or by means of a shoe.) This coefficient appears to vary very slightly with K: but this variation, even if it were certain, would not be of sufficient importance to be taken into account. The values of a to be assumed (the variations being calculated in metres per second,) are 0·03 when the wheels slide directly on the rails: 0·07 when a shoe is interposed.

The author thinks that this formula is in sufficiently exact accordance with the experimental results of M. Morin: the term $a\,v$ becoming too small to affect the results at his velocities; he thinks, moreover, that when the resistance of the air is taken into account, the discussion of these results shows a commencement of the diminution of the friction with an increasing velocity. He believes, therefore, that this phenomenon is general, and that it may be expressed by the formula above, or perhaps better by the formula $\frac{f}{p} = \gamma + \frac{k\,\gamma}{1 + a\,v}$. K keeping the values determined for it by M. Morin, as long as the condition of his experiments are kept, while the values of a, (and perhaps, sometimes of γ,) must be determined in the different cases of slipping.

Certain facts stated in the memoir also lead to the suspicion, that under conditions very different from those of M. Morin's experiments, the friction may not be entirely independent of the extent of the surfaces, but this subject will require an especial study.—*Comptes Rendus de l'Académie des Sciences de Paris, April* 26, 1858.

NOTE.—It is worthy of notice in this connexion, that the observations of the Committee of the Franklin Institute, upon the friction of vessels being launched, lead to a coefficient only about one-half as great as that determined by M. Morin. See *Journal Franklin Institute,* 3d series, vol. vii, page 108. ED.

For the Journal of the Franklin Institute.

On the Relative Evaporating Power of Brass and Iron Tubes.

By J. R. Robinson, Esq., Engineer.

In the discussion that followed the reading of the paper on the relative evaporating power of brass and iron tubes, before the "Institution of Mechanical Engineers," by Mr. George Tosh, as reported in the June number of the *Journal of the Franklin Institute*, one very important fact seems to have been lost sight of, which is, that in locomotive boilers of the ordinary construction, combustion goes on to some extent within the tubes, that is, the combustible gases do not all unite with oxygen in the fire box of the boiler, but the mixed gases are drawn into the tubes while the combustion is going on. Now the greater the conducting power of the tubes—other things being equal—the sooner will the temperature of the gases be reduced below that necessary to insure their chemical union: so that, in such a boiler it may make but little difference so far as its evaporating power is concerned, whether brass or iron tubes are used, for what is gained, on the one hand, by the greater power of the brass to transmit the heat from the gases passing through the tubes to the water in the boiler, may be balanced by the loss arising from the less perfect combustion of the gases within the tubes. While on the other hand, although the iron tubes do not transmit the heat from the gases so rapidly as in the case of the brass tubes, the temperature of the gases is not so soon reduced below that necessary to insure combustion, and more heat is *generated* from the same weight of fuel.

Experiments made by the writer in January, 1855, with water as the heating medium instead of gases, as in the case of the locomotive boiler, gave the conducting power of copper, brass, and iron tubes as follows:

Iron,	100	Brass,	136	Copper,	171

Experiments made by J. R. and H. S. Robinson, of Clinton, Mass., in January and February, 1856, with brass and iron tubes in boilers so constructed that combustion took place before the gases were drawn into the tubes, resulted in showing that 1000 square feet of brass tube surface, was equal in evaporating power to 1300 square feet of iron tube surface.

Clinton, Mass., June 22d, 1858.

For the Journal of the Franklin Institute.

On Curves for Mechanical Draughtsmen. By H. Howson, C. E.

Curves form an indispensable adjunct to the mechanical draughtsman's stock of instruments. Without them it is impossible to give to the details of machinery those forms instrumental alike in presenting a pleasing effect, and in affording the proper strength at the expense of the smallest amount of material.

The want of useful and graceful curves is inadequately supplied by the variety of scrolls imported from France and Switzerland, an exten-

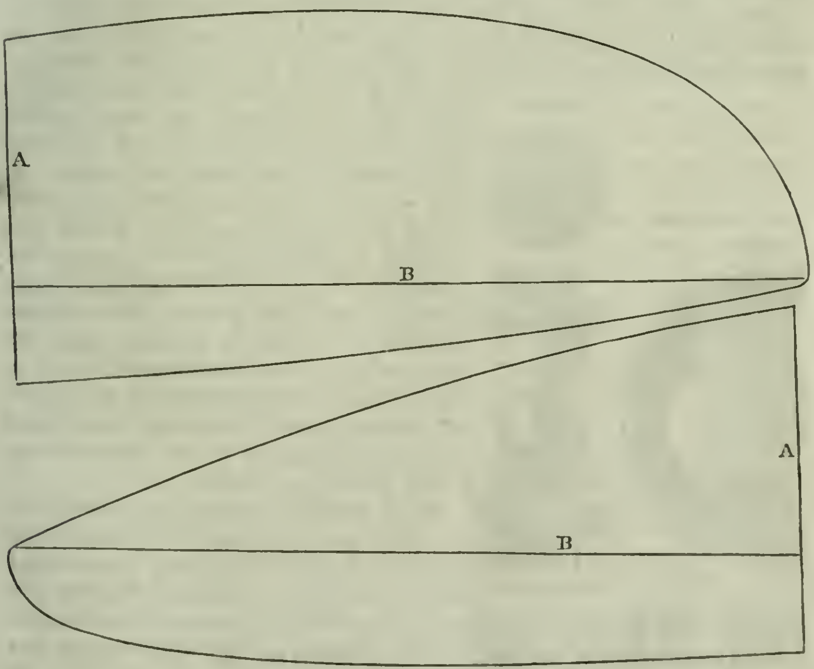
sive variety of which is required to meet the exigencies of the draughtsman.

The frequent use for, and constant want of, efficient curves, induced the writer several years ago to make experiments, with the view of producing a variety of curved forms, independent of any known rules for laying them out. It was found that by taking a sharp pointed pencil in the right hand, holding the whole arm at liberty without any rest for the wrist or elbow, stretching the arm out, and bringing the pencil with a very sudden sweep towards and from the body, with the point of the pencil in contact with a sheet of smooth drawing paper, the most graceful forms may be produced. These forms may be varied and modified so as to present abrupt or gentle curves by altering the position of the wrist, elbow, and shoulder joints, with respect to each other, before the pencil is brought in contact with the paper, and by altering the length and breadth of the sweep given by the arm.

It is indispensable to the formation of a pure curve, that the movement of the pencil should be sudden.

The annexed engraving represents two curves produced in the above described manner.

For convenience of insertion in this periodical, the instrument is shown



in two parts. To render it complete, the transverse line A, of one figure should coincide with that of the other, and the horizontal lines B, should be in the same straight line.

This curve has been selected for illustration as one which has been

found practically useful, the original having been the writer's constant companion for the last fourteen years. The number of objects to which the two edges of the instrument are applicable is somewhat astonishing. Its utility indeed can only be appreciated by actual use. By tracing the figures with a fine pointed pencil, pasting the two tracings in their proper relative positions on a piece of veneer of pear, apple, or box-wood, as the best material, and, when dry, cutting and filing the edges to the lines, and subsequently removing the paper with a wet sponge, fac similes of the original curve may be produced. By passing the finger along the edges of the curves, the slightest irregularities may be discovered, and these readily removed with a fine file.

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*Improvements in Pistons.**

We give the accompanying illustration of a very important, but exceedingly simple invention, by Messrs. Molineaux & Nichols, of the Brighton Railway Locomotive Works, for superseding the use of metal springs for expanding metallic piston packings. They simply bore the sides of the piston truly, and fit into the hole so bored a double-hinged spindle valve, as shown in accompanying illustration. The two valve faces are expanded by a spring, and kept close against the interior faces of the piston plates, surrounding the holes bored therein, and upon the steam being admitted on either side of the piston, the valve is acted upon thereby and opened, and thus the full pressure of the steam is brought to bear within the annular space or chamber in the piston, and so acting behind the metallic packing expands it; upon the direction of the motion of the piston being changed, the steam will act on the opposite side of the piston, and also upon the opposite end of the double-spindle valve, and, as before, the pressure of the steam will be permitted to enter the piston, and so be communicated to the back of the piston packing as before.

Fig. 2.

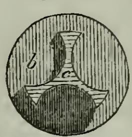
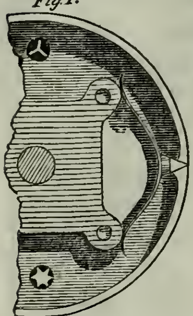


Fig. 1.



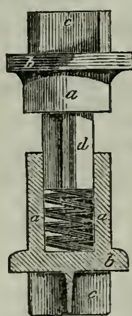


Fig. 3.

Many attempts have been made to employ the elastic pressure of steam and the pressure of fluids to expand pistons and bucket packings, by means of hollow piston rods with lateral openings into the piston, by means of small holes drilled in the ring of the single body pistons, and by other means, but practically, so far as we know, none of these have ever been sufficiently successful to permit of their being continued in use. Now the present invention has been practically tested in the most severe and sufficient manner, and we have watched with considerable interest these trials,

*From the London Artizan, June, 1858.

and we are enabled to state that they have proved entirely successful; and one point which is of considerable importance is, that no loss of steam results from its use, the piston space not being, as might be supposed, filled and emptied at each stroke; as, indeed, after the piston has been once filled with steam, it is but the pressure which is communicated alternately at one side and the other, the original volume remaining unchanged.

For locomotive engines there is a very great advantage pertaining to this plan, viz: that when the steam is shut off, as when descending inclines, &c., the pressure is removed, and the friction which would be due to the constant pressure of metal springs does not occur.

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*Penn's Patent Apparatus for Taking the Thrust of Screw Propellers.**

Mr. J. Penn, Engineer, of Greenwich, has patented an improvement in apparatus for taking the thrust of screw propellers, in which the use of bearings of wood, already found so successful in other cases, is applied to the purpose. A disk or plate (by preference made in two parts, so as readily to be fixed and removed) is applied between the boss of the propeller and where the propeller shaft passes into the ship or vessel. In this plate or disk are fixed pieces of hard wood at intervals in such manner that the pieces of wood somewhat protrude beyond the surface of the disk or plate. The disk or plate is made suitable for the propeller shaft to turn freely in an opening through its centre, and it is applied in such manner as to be held from turning with the propeller shaft. The forward surface of the boss or nave of the propeller, or of a plate fixed thereto, is formed or turned truly, and is, when the propeller is at work, constantly pressed against the projecting surfaces of wood in the plate or disk, which is, as before mentioned, applied where the propeller shaft passes into the vessel. The thrust of the propeller is thus received by the pieces of wood fixed to the plate or disk, and this, being attached to the stern post of the ship or vessel, transmits to it the thrust of the propeller. The plate or disk and the wood fixed to it, being immersed in the water, will be constantly well lubricated therewith. Although it is preferred to have the pieces of wood applied to a plate or disk capable of being readily removed, this is not essential, and in place of the pieces of wood being applied, as above explained, they may be applied to the boss of the propeller, or to a plate or disk fixed thereto, or to the propeller shaft, so as to revolve therewith. In which case the pieces of wood, when the propeller is at work, will be pressed against a plate or surface formed or fixed around where the shaft of the propeller passes into the ship. And, although it is preferred that this apparatus should be external of the vessel, like apparatus to take the thrust of a propeller may be applied within the vessel, in which case the rubbing surfaces should be kept well lubricated with water.

* From the Mechanics' Magazine, March, 1858.

For the Journal of the Franklin Institute.

Wixted's Railroad Chair Press. Notice of a Hand Press for turning up the Lips or Wings of Wrought Iron Railroad Chairs. Invented by Mr. James Wixted, Master Blacksmith of the Upper Schuylkill Railroads, in Pennsylvania.

The general use upon American railways in their original construction of light wrought iron joint chairs, weighing from 7 to 10 lbs. each, (with lips turned up,) has caused the erection in many places, of factories, where stamps and presses operated by power, manufacture these chairs from plate iron, the former cutting out the blank and punching the spike holes, the latter turning up the wings from the heated blank.

There are many cases, however, especially in the after maintenance of railway superstructures, where for repairs or extensions, it is desirable to have in the smith shops of a railroad, the means of readily turning up a wrought iron chair from a flat plate, without erecting a regular chair factory for that purpose, and such is the object of the present invention.

Col. Franklin Hewson, C. E., desiring to adopt upon the railroads under his charge, a wrought iron chair with unusually long wings (12 inches) so as to make with a long wrought iron chair, a joint between ties, desired his master blacksmith, (Mr. Wixted,) to prepare the means necessary to effect his purpose of making a long wrought iron chair, of the kind described in the late discussion before the Franklin Institute on "*rail joints.*"

Mr. Wixted devised the very simple hand press illustrated in the annexed cut, which is found to answer perfectly its intended purpose of turning up a chair from a wrought iron blank previously prepared, slit and punched for the spike.

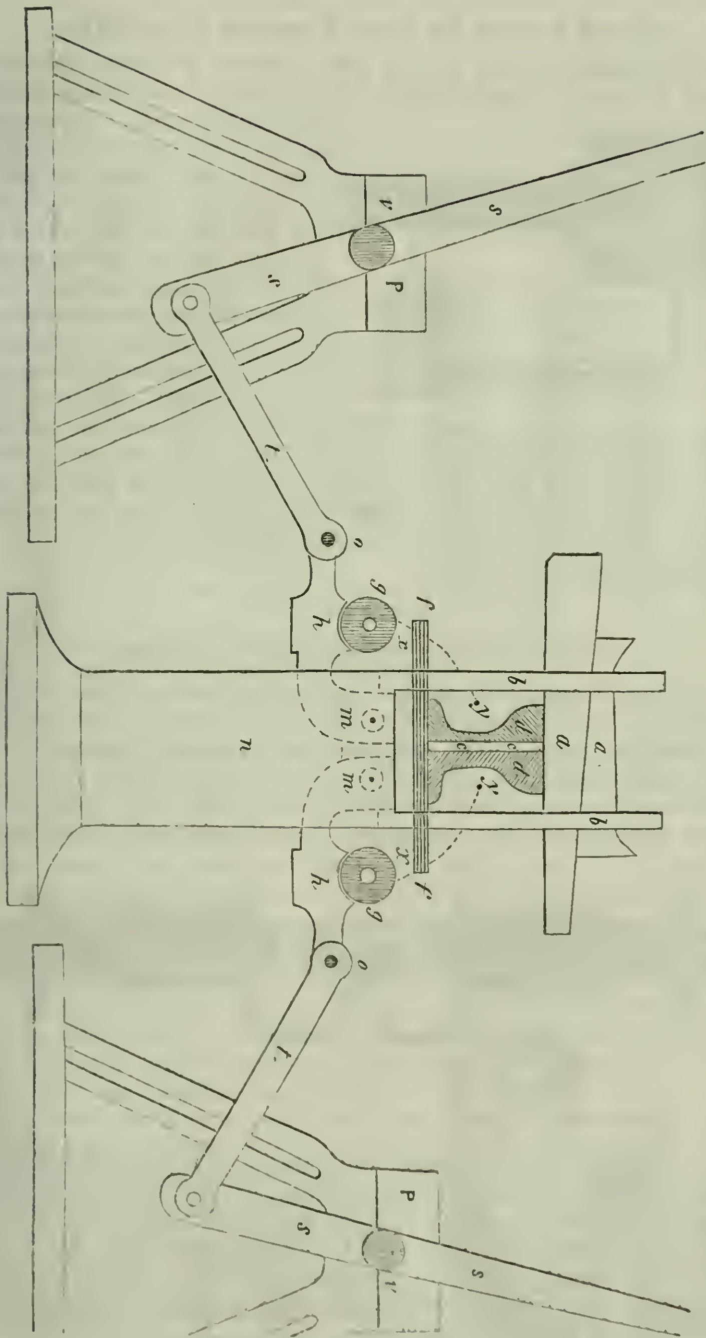
This press costs $60 only, and Colonel Hewson says:

"That with it, *two* men at a common smith's fire, can make 60 long chairs per day, and allowing for the coal used, the cost would be about four cents each, for turning.

"But if a heating oven is employed, *two* men can make 120 chairs per day, the cost in that case being little over two cents each. So that the difference in the cost of turning chairs by the hand press, or by the power machine, can in no event be serious.

"I have supposed herein, that the chair blanks will be punched for the spike holes, &c., at the mill, and am now obtaining blanks thus prepared (of $\frac{5}{8}$th plate,) in small quantities, at $80 per ton." M.

Description of the Cut.—Wrought iron keys, *a a*, are inserted through yokes, *b b*; they hold the rail *d d*, (or die,) which is divided longitudinally into two equal parts. *c c* being a wrought iron plate $\frac{5}{8}$ inch thick, which is drawn out to disengage the chair after it is turned, giving an allowance of $\frac{1}{4}$ inch for shrinkage; the rollers *g g*, move in the arc *x y;* they work in castings *h h*, which are the arms of the compound levers *h, t, s*, whose joints are at *m, o, s, v*, the arms *t t* are wrought iron; *s s* are levers 8 feet in length, P P are the stands for the levers—being the ordinary switch pedestals in use—*n* is the cast iron body of the press.



v
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y
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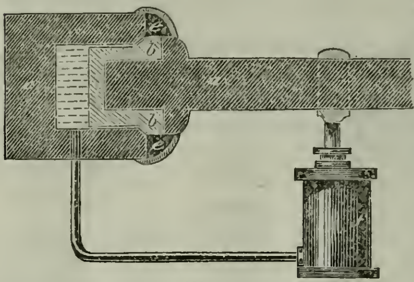
*Thrust Bearing for Screw Propellers.** By J. Hope.

Gentlemen :—I beg to send you a plan of a bearing to take the thrust of screw propeller shafts. The object is to diminish friction,



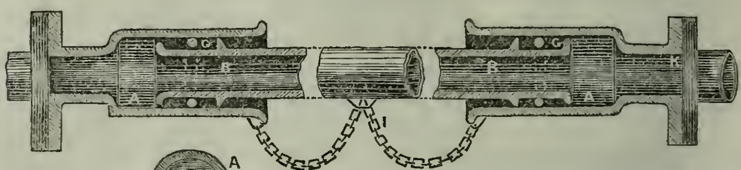
and, consequently, wear and tear, and I think with this plan there would scarcely be any at all. *a* is the propeller shaft, *b* is a brass cap fastened on the shaft end, against shoulders on the shaft. *c* is a strong cast iron block, bored to admit the brass cap and beveled, as shown, like a valve. *f* is a small force pump driven by the same, or any other shaft. When the propeller is in motion, the pump is constantly forcing water or any other fluid into the block behind the shaft end, and there is no other vent but at the beveled faces; consequently the water must bear the entire thrust. *e* is a cover to prevent the water flying off, and to conduct it into vessels, whence it is again pumped into the block.

Bishop Auckland, Feb. 27, 1858.

Fenton's Improved Feed Pipe Connexions.†

Fig. 1 of the engravings is a longitudinal section of an improved feed pipe, recently introduced by Mr. James Fenton, the able engineer of Low Moor Iron Works, and described by him at the Institution of Mechanical Engineers. Fig. 2 is a transverse section. A A are two cylinders of brass or iron, one of which is bolted in the usual manner to the feed pipe of the engine, and the other to that of the tender;

Fig. 1.



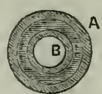


Fig. 2.

they are both bored out smooth and parallel. B B is a connecting tube of brass or iron, having the ends turned. G G are elastic rings of vulcanized india rubber, which, when at work, roll between the cylinders A A and the connecting tube B. I I are light chains used for the purpose of keeping the tube B in its proper position; they are each left slack to an extent of one-half the greatest amount of travel required between the engine and tender.

* From the Lond. Mech. Mag., March, 1858. † From the Lond. Mech. Mag., Jan. 1858.

The advantages which this arrangement appears to possess are its extreme simplicity, and consequent cheapness both in first cost and current repair; and the great durability of the only wearing parts, the motion of the elastic rings when at work being a *rolling* instead of a *rubbing* action. Also, the absolute tightness of the joints when steam is blown from the boiler into the tender tank, as the elastic rings G G are then forced up against the collars on the tube B, for the purpose of enabling the rings again readily to adjust themselves to their proper position when the pressure is removed, which they do as soon as the engine is put in motion.

The india rubber rings G are made slightly larger than the space into which they fit, for the purpose of insuring a thoroughly water-tight joint; the cylinders A are $3\frac{1}{16}$ inches inside diameter, and the tube B, 2 inches outside diameter, as in the figure; the ring is made $3\frac{1}{8}$ inches outside diameter, and $1\frac{7}{8}$ inches inside diameter, the section of the ring being a circle of $\frac{5}{8}$ inch diameter.

Should either of the tender valves get out of order on the journey, and it becomes necessary to stop the feed by other means, it is only requisite to slack back the bolts which hold the flanches together, and introduce a piece of sheet iron or zinc between them, of sufficient width to cover the orifice of the feed pipe. This simple and effectual mode of stopping the feed was suggested and adopted by Mr. Ramsbottom, of the London and North Western Railway, on which, as well as on several other lines of railway, this water connexion has been in successful operation for several months.

After Mr. Fenton's description was given at the above-named Institution,

Mr. RAMSBOTTOM said he had had one of these coupling pipes in use rather more than two months on a locomotive, and it had worked very satisfactorily.

Mr. CRAIG had had one of them at work about three months, applied to a stationary force pump working under 300 lbs. per inch pressure, and it had proved quite successful. He had now applied them to several locomotives, and was well satisfied with the results.

Mr. T. FORSYTH thought there was no doubt of the success of the plan with cold water, as shown in Kennedy's water metre; but he understood that when fixed near to a boiler for measuring the feed water, the india rubber ring was found to be injuriously affected by the heat; and he feared that when used much with steam blown through into the tender, the rings would not be found to stand.

Mr. FENTON said, he expected they would prove quite satisfactory in that respect, as some of the couplings had already been working three months with the original rings, in regular work, exposed to the ordinary blowing through of steam into the tender; and the rings were still at work, showing no sign of injury. But even if they were frequently worn out, the whole cost of maintenance would be very small, as it cost only 6*d.* each to renew the rings, or 2*s.* per set.

Mr. SIEMENS remarked that the vulcanized india rubber was manufactured at a high temperature, above 300° Fahr., and was not inju-

riously affected by exposure afterwards to a lower temperature; it proved very durable if its elasticity was not brought into action too severely, but a kneading action was very destructive, by breaking up the cohesion of the mass.

Professor RANKINE had used an india rubber ring to make a steam joint at as high a temperature as 550°, in a model where it was exposed to the steam at about 1000 lbs. per inch, and it had stood well if undisturbed; but when the joint had been several times broken, the india rubber was found to fail. India rubber suffered great injury also from the effect of oil, which caused its substance to become disintegrated or broken up.

The Chairman inquired what was the comparative cost of the new couplings and the ordinary brass ones.

Mr. FENTON replied, that their cost was £2 per set as compared with about £12 12*s*. for the brass ball and socket couplings, being only about one-sixth in first cost, and there was also a considerable saving in cost of maintenance. The rolling action to which the packing rings were subjected did not appear to be injurious to their material, as they had already run upwards of 8000 miles without any sign of injury, although exposed to the heat of blowing steam into the tender in the ordinary manner.

Description of the Hoisting Planes of the Mine Hill and Schuylkill Haven Railroad Company.

[Extracted from the Twenty-ninth Report of the Mine Hill and Sch. H. Railroad Company.]

The railway tracks upon each plane are quadruple, there being two tracks of heavy rails, laid of the usual width or gauge, for carrying the trains of cars, and two of narrower gauge, lying with the former, on which run the hoisting trucks. These narrow tracks terminate at the foot of each plane in pits, excavated between the rails of the wider tracks, deep enough to allow the hoisting trucks to run entirely below the passing trains. The hoisting action of the planes is reciprocating; a train of loaded cars going up on one track, while a train of empty cars goes down on the other; each of the tracks being alternately used for hoisting and lowering.

Propulsion is given to the ascending train, by the hoisting trucks, one of which stands when at rest in one of the pits at the foot of the plane, and the other on the opposite track at the head of the plane.

To the forward or upper end of each truck is attached the hoisting rope, a wire rope of great strength, which extends from the truck at the foot to the head of the plane, and there after passing around certain propelling drums to be presently described, is carried by a horizontal rendering sheave, eleven feet in diameter, to the opposite track, at the head of which stands the second hoisting truck, made like the first, narrow enough to run on the narrow gauge, entirely within the rails of the wider gauge track. To the hinder end of each of these hoisting trucks is attached a light wire rope called the tail rope, which

passes from the truck at the head to the foot of the plane, and at the latter point is carried around certain horizontal rendering and tightening sheaves placed in the pits before named, until it reaches the truck standing in the pit on the opposite track.

It will be seen that the rope is thus made continuous from the head to the foot of the plane and back again, forming an endless line, about two miles in length of circuit. This long line of rope is supported upon numerous small rollers, placed twenty feet apart along the centre line of each track, and is kept in a proper state of tension by heavy weights attached to the tightening sheave at the foot of the plane, where it has sufficient longitudinal play to counteract the casual variations in the length of the rope.

The hoisting rope receives its motion from two propelling drums, twelve and a half feet in diameter, situated a short distance beyond or above the head of the plane, and driven by a pair of stationary engines of four hundred horse power.

These drums are made of iron, and so constructed as to insure great strength, and most exact equality of circumference, and are connected by spur gearing, so as to revolve accurately together in opposite directions. To increase their steadiness, they are placed close enough to roll upon each other, up broad flanches or shrouding, turned true and raised on their peripheries, to the pitch circle of the gearing teeth. This shrouding serves the double purpose of steadying the revolving drums and strengthening the gearing.

Around these two drums the hoisting rope is carried, in a peculiar convolution, in the form of the figure 8, embracing nearly three-fourths the circumference of each drum, and crossed at their tangential line; this form of convolution being necessary to cause the oppositely revolving drums to concur in propelling the rope.

The surface of the peripheries, upon which the rope bears, is formed of a packing of short blocks of beech-wood, so fitted in their place as to present the end of the ligneous fibre to the action of the rope.

When the machinery is in action, hoisting an ordinary train of seven loaded cars, and lowering seven empty cars, the tension of the rope on the hoisting side is estimated to be equal to about nine tons, or twenty thousand pounds, and one-fourth as much on the side of the descending train; requiring a frictional adhesion, to prevent its slipping upon the peripheries of the drums, equal to the difference of these weights, say of not less than fifteen thousand pounds.

It may be worth while to record here, in passing, a practical datum appertaining to mechanical science, derived from the working of this hoisting apparatus.

During the past year, the whole number of cars, of all kinds, hoisted, was eighty thousand two hundred and ninety-two; weighing, with their contents, over five hundred and fifty thousand gross tons: an equal number of cars, mostly empty, weighing about two hundred thousand tons, were in the same time lowered. In doing this work, the hoisting rope traveled around the drums a distance of more than eleven thousand miles, requiring the drums to make one and a half million revolutions.

The effect of these one and a half million impressions of the wire rope upon the wooden packing on the peripheries of the drums has been to wear into it a groove, semi-circular in cross section, two inches wide and one inch deep, affording a remarkable proof of the resisting powers of wood, when properly applied.

It will be perceived that the arrangements are such as to avoid the necessity of attaching the trains of cars to the rope by temporary fastenings, an operation attended with both delay and danger.

All that is required is to run the train to be hoisted, up the foot of the plane far enough to pass the pit in which stands the hoisting truck, and to let the train that is to be lowered, run down the head of the opposite track, until it is stopped by the truck standing there.

As soon as these simultaneous acts are done, a telegraphic signal notifies the engine man, who immediately starts his engines, and puts the whole circuit of rope and the two hoisting trucks in motion: the one at the head of the plane moving down, followed by its train of empty cars, which now run by their own gravitation, being only restrained in their speed by the truck. The other truck rises out of its pit, until it strikes the hinder end of the upward loaded train, which it propels to the head of the line. Both trains reach the respective termini of the plane at the same moment, and, being free from any attachment to the rope, they immediately pass on with their acquired velocity; the one that was hoisted running on to a level track at the summit, whence it is taken by locomotive power, and the lowered one passing overhead of its truck—which is now in the pit—and running on a short piece of nearly level track to the head of the next plane, where it is caught by the truck waiting to receive it.

This alternate action is kept up continuously, with no longer interval of cessation than is required to allow the trains to pass to and fro out of each other's way.

The Report from which the foregoing description of the hoisting machinery is extracted, omits to state what part, if any, is claimed as original in plan or construction. On making inquiry upon this point, we learn that the Company lays no claim to originality or novelty of contrivance. But presents the whole as a judicious combination of various mechanical devices, nowhere else applied in similar combination, or upon so large a scale, the practical results of which are entirely satisfactory. EDITOR.

For the Journal of the Franklin Institute.

Steam and its Condensation. By THOMAS PROSSER, Civ. Eng., N. Y.

Having been permitted through the liberality of the publishing committee, to lay before the readers of this Journal* my peculiar views or theory, designated The "*Differential* System of Steam Power," and "*Hot Water* System of Condensation," it is with no small pleasure, that I again appear before its readers, to announce the complete success of its practical application, and to exhibit, by a diagram prepared for the purpose of elucidation merely, and therefore omitting all unnecessary detail, which would only tend to confusion, the modus ope-

* Vol. xxxi, 3d series, p. 343—vol. xxxiv, p. 199—vol. xxxv, p. 94, and vol. xxxvi, p. 4.

randi by which it is accomplished. More than this, I have shown by a mere schoolboy operation, how much heat enters the apparatus in the exhaust steam, and what becomes of it.

In following out these calculations, for the purpose of scrutinizing them with the utmost severity, which scrutiny I urgently invite, a reference may be had to the Tables at page 7 of this volume.

It may be thought that although the diagram, with its little *sum in addition*, is so a, b, c like, a small deviation therefrom in the temperature and pressure of the *exhaust steam* may upset the whole.

To show that this is not the case, I have prepared three *balance sheets* in *mercantile* form, with the exhaust steam ranging from 105° to 130° C., and corresponding with a back pressure upon the piston from a little above the atmosphere to twenty-five pounds to the square inch above it, without producing any derangement to its symmetry, and I will now add that, should circumstances require it, the back pressure upon the piston may be increased to the extent of the working pressure now usually applied, without any detriment or difficulty, and I am not quite sure that great economy of fuel will not be the result.

Be this as it may, I shall establish to the fullest extent, every claim which I have ever made for these systems. For *comprehensiveness* of range, whereby the back pressure and consequent temperature of the exhaust steam may be carried to any extent, so as to insure beyond the slightest doubt, an abundant supply of distilled water to recuperate that of the boiler, the "*hot water* system of condensation" has no rival. It is true that a separate vessel called an evaporator, is an adjunct to most, if not all of the patented condensers except mine, but they are delusions, one and all, and exist only on paper; they are nowhere in use, for the very simple reason that they are entirely useless—complete abortions—the best of them resolving itself into a boiler.

This is the POINT to be attained, *a recuperative supply of pure water to make up for the boiler waste*, compared with which, all other considerations sink into insignificance. Bearing *this* in mind, I now invite attention to the diagram Plate I*—where it will be seen that there is an entirely free exhaust for the steam through the bottom of the "heater condenser" *cistern*, into the "main condenser," where even the steam is still hot enough to boil the water which surrounds it, so little is its temperature reduced by the heater, in consequence of the water therein having entered it at so high a temperature. Of the "100 lbs." of steam entering and containing "63850° C." of heat, it is calculated that as much of the latter may be transferred into the "hot water" as will evaporate "40 lbs." of it, and thus form secondary steam, (or "vapor" by way of distinction,) all of which may be forced by its own elasticity over into the "still condenser," of which "30 lbs." may escape as vapor, while "10 lbs." become condensed, and by means of a small transfer pump, is united to the "100 lbs. of water," ("condensed steam") from the "main condenser," and both together are pumped through the "heater" into the boiler. While this is going on, the hot condensing water is being forced up the pipe and away to waste. Now

* And also to the balance sheet No. 1, which corresponds with it.

observe, it is the height which the vapor has to lift this column of water before it can escape, which regulates the temperature, and of course, the back pressure of the exhaust steam upon the piston, as well as the temperature of the feed water.

The exact manner in which the escape of the "waste hot water" and of the "vapor," maintain an equilibrium, is not a little singular, viewed through the medium of a glass gauge on the outside of the cistern. If the water is not hot enough to form vapor of the requisite tension, the vapor alone will escape, but on that very account it will necessarily be very slow, much slower than the accumulation of heat in the "hot water," in consequence of which, an equilibrium is almost immediately re-established after any interruption, and the "hot water" flows one way, and the "vapor" another, in exact mathematical proportions, variable at pleasure, by the operator.

It will be observed, that nearly all the air which separates from the condensing water, is compelled to escape with the "vapor," and find its way into one of the "reservoirs" below. A portion of it will be united to the condensed vapor, and with it will be pumped into the other "reservoir," from which it can only escape with the feed water into the boiler.

This is important, if, as many suppose, the most terrific explosions arise from a deficiency of air in the boiler water.

The "*tell-tale*" character of this condenser is not to be overlooked, for with the glass gauge and seven cocks, a child may be taught to tell whether the apparatus is working properly or not. Without going into unnecessary detail, the reader will readily see that the following questions admit of instant reply.

Is the supply of condensing water sufficient?

Look at the glass gauge, and if the water is visible, the answer is yes.

How much distilled water are the "main" and "still" condensers producing?

Turn two cocks connected with a cup in the reservoir, which catches the water as it descends, and conveys it outside through the cocks.

Are the feed and transferring pumps effective?

Open the two pet cocks in the reservoirs; if no water comes, the pumps are taking it all.

Does the "heater" condenser leak?

Take out the check valve, but replace its cap, and then let on the boiler pressure, and open the cock in the cistern.

Do the "main" or the "still" condensers leak?

Open the two cocks before referred to.

Note.—The three last operations require that the engine be stopped.

Is there any mud in either the "main" or condenser cisterns?

Open the cocks and see.

I am not aware of any other question to which an answer can possibly be required, as necessary to a proper knowledge of the working of the condenser, and therefore I claim for it a simplicity which has never before been attained by any condenser whatever, having the same objects in view, for, with the exception of a very simple contrivance called

the "regulator," which controls the quantity of water allowed to enter the main condenser cistern, there is no mechanism to get out of order. There are three pumps, the largest of which need not be more than double the area of the ordinary feed pump of a condensing engine; that is the cold water pump; the feed pump may deliver one-fourth, and the transfer pump one-sixteenth as much. No air pump is required, and therefore we have the simplest of all steam engines, the ordinary high pressure one.

In calculating the first cost of this condenser, it should be remembered that it occupies the place of air pumps, condenser, heater, and distilling apparatus, the latter being inevitably a whole boiler and still, to be of any service. The small space occupied by my apparatus in comparison with the incumbrances removed, is of no small importance. Add to this the reduction of the boilers to at least one-half their present dimensions, with a corresponding reduction in the consumption of fuel, and we have the cheapest condensing apparatus ever known, and one which, from the experience of eighteen months in salt water, and the worst possible kind of usage, there is every reason to believe will last *ten years* if not more, in salt water, which is more than three times as long as any now known are pretended to last.

The copper tubes in the condensers of the "*Arago*," were worn out in less than two years. Those in the "*Keystone State*," according to Mr. W. Jones, in this *Journal*,* gave out in an incredible short time, the vessel only "*having run several thousand miles.*" If, however, as Mr. Jones says, they (the tubes) "were in use for a considerable time," the vessel must be a remarkably slow one. The idea of tinning "upon the inside and outside" is certainly amusing, for if the copper withstood the action of the torrent of condensing water but one month, it can scarcely be possible that the tin will remain for a single day. But if it does remain, what then? What effect will it have upon condensation? Copper being one of the best and tin one of the worst conductors of heat. That "sea water has no action upon pure copper," is a great mistake on the part of Mr. J.

The "*Fulton*" fared no better as regards her condenser tubes, which are also of copper, while those of her boiler were of brass, which have been removed and replaced with iron ones after two years' use.

The boiler tubes of the Collins line of steamers, were all of iron originally, but after a few years were replaced with brass, but again, iron gained the precedency in the "*Adriatic.*" The average life of the iron tubes did not exceed two years and a half. The average cost of each new tube, and of the labor and use of tools for substituting it for the one removed, were about equal, but the cost for scaling was not less than double that amount, so that every tube really cost four times its original value, before it had disappeared and was replaced. The actual cost of iron tubes, including the cost of cleaning them, has not been less than ten dollars per annum per horse power, while the cost of fuel, together with all its concomitants of boiler and firemen, is not less than twenty times as much, making two hundred and ten dollars ($210) per

* Vol. xxxv, 3d series, p. 414.

annum per H. P., of which one-half may be saved; and one-half of that will pay for a condenser that will do it for ten years without costing as much for repairs as an ordinary one.

It must be borne in mind that the tubes usually commence to give out on the first voyage, and continue to give out in an accelerated ratio until at the expiration of five years all the original tubes are calculated to have disappeared. If, therefore, some of them will last for *more* than five years, under such unfavorable circumstances as they are placed in, that is to say, in a boiler where the heat is intense and unequal, and the point of saturation of the water at which deposition takes place is often arrived at, how long may they be expected to last where the very reverse of these unfavorable circumstances occur? where, in fact, the temperature is moderate and equal, and where the point of saturation of the water at which deposition takes place, never can be arrived at.

These considerations and many others, have convinced me that iron alone should be used both for boilers and condensers of sea-going steamers, as well as for all others, and that the saving which the use of my condenser will effect, is far beyond anything that I have stated.

I have spent a fortune and many years of my life in perfecting it, and having *succeeded*, I am surely entitled to a trial, or to evoke the engineering talent of the country to prove that I have not.

Table No. 1.—*Account current of one hundred horse power Steam Engine Condensers. for one minute.*

Dr.	Temp.	Weight.		Total heat.	Total heat.
	°C.	lbs.	@	°C.	°C.*
To total heat in exhaust *steam* entering the cistern of Heater Condenser, at a temperature of	105				
Weight,		100	×	638·5	63850
Cr.					
By total heat in condensed exhaust steam (feed-water) departing from the Heater Condenser (for the boiler,) at a temperature of	102				
Weight,		100	×	102	10200
By acquired heat in distilled *water*, departing as above, and at the same temperature of . . .	102				
Being a portion of the condensing water which entered the cistern of the Distilling Condenser, at a temperature of .	13				
Became vaporized in the main cistern, and entering the Distilling Condenser was therein condensed, and then pumped up through the Heater Condenser, having acquired .	89				
Weight.		10	×	89	890
Note.—The above two items make 110 lbs. of feed-water entering the boiler at 102° C., but the 10 lbs. is allowed for loss between leaving the Heater Condenser, and returning as exhaust steam into its cistern.					
By acquired heat in condensing *water* departing from the main cistern, at	102 †				
In 45 galls. of waste hot water which first entered the Distilling Cistern, at . . .	13				
Weight,		300	×	89	32040
By total acquired heat in *vapor*, departing via the chimney, at	102			637·5	
From the main cistern direct, or after having passed through the distilling condenser, uncondensed, being a portion of the condensing water which entered the distilling cistern, at .				13	
Weight,		30	×	624·5	18735
Note.—Condensing water 50 gallons, weight, . .		400			
By Flotsam and Jetsam, (radiation and leakage,) may be .					1985
Equivalent to 22 lbs. more of condensing water.					
					63850

* Erratum, to Merchants only, for °C. read dollars. † Erroneously marked 95° C., in Plate I.

TABLE No. 2.

Dr.	Temp.	Weight.		Total heat.	Total heat.
	° C.	lbs.	@	° C.	° C.
To total heat in exhaust *steam* entering the cistern of Heater Condenser, at a temperature of . . .	110				
Weight,		100	×	640	64000
Cr.					
By total heat in condensed exhaust steam (feed-water) departing from the Heater Condenser (for the boiler,) at a temperature of	105				
Weight,		100	×	105	10500
By acquired heat in distilled *water*, departing as above, and at the same temperature of	105				
Being a portion of the condensing water which entered the cistern of the Distilling Condenser, at a temperature of .	13				
Became vaporized in the main cistern, and entering the Distilling Condenser was therein condensed, and then pumped up through the Heater Condenser, having acquired	92				
Weight,		10	×	92	920
NOTE.—The above two items make 110 lbs. of feed-water entering the boiler at 105° C., but the 10 lbs. is allowed for loss between leaving the Heater Condenser, and returning as exhaust steam into its cistern.					
By acquired heat in *water* departing from the main cistern, at	105				
In 45 gallons of waste hot water which first entered the Distilling Cistern, at	13				
Weight,		360	×	92	33120
By total acquired heat in *vapor*, departing via the chimney, at .	105			638·5	
From the main cistern direct, or after having passed through the Distilling Condenser, uncondensed, being a portion of the condensing water which entered the Distilling Cistern, at .				13	
Weight,		30	×	625·5	18765
NOTE.—Condensing water 50 gallons, weight, . .		400			
By Flotsam and Jetsam. (radiation and leakage,) may be . . Equivalent to 6 lbs. more of condensing water.					695
					64000

TABLE No. 3.

Dr.	° C.	lbs.	@	° C.	° C.
To total heat in exhaust *steam* entering the cistern of Heater Condenser, at a temperature of . . .	130				
Weight,		100	×	646·1	64610
Cr.					
By total heat in condensed exhaust steam (feed-water) departing from the Heater Condenser (for the boiler,) at a temperature of	120				
Weight,		100	×	120	12000
By acquired heat in distilled *water*, departing as above, and at the same temperature of	120				
Being a portion of the condensing water which entered the cistern of the Distilling Condenser, at a temperature of .	13				
Became vaporized in the main cistern, and entering the Distilling Condenser was therein condensed, and then pumped up through the Heater Condenser, having acquired .	107				
Weight,		10	×	107	1070
NOTE.—The above two items make 110 lbs. of feed-water entering the boiler at 120° C., but the 10 lbs. is allowed for loss between leaving the Heater Condenser, and returning as exhaust steam into its cistern.					
By acquired heat in *water* departing from the main cistern, at	120				
In 45 gallons of waste hot water which first entered the Distilling Cistern, at	13				
Weight,		360	×	107	38520
By total acquired heat in *vapor*, departing via the chimney, at,	120			643·1	
From the main cistern direct, or after having passed through the Distilling Condenser, uncondensed, being a portion of the condensing water which entered the Distilling Cistern, at .				13	
Weight,		30	×	630·1	18903
NOTE.—Condensing water 50 gallons, weight, . .		400			
					70493
Being equivalent to 55 lbs. too much of condensing water.					5883
					64610

*On an Apparatus for the Prevention of Smoke in Steam Boiler and other Furnaces.** By Mr. William B. Johnson.

Although it is generally admitted by those using steam boilers, that introducing cold air for the prevention of smoke may be made to effect that object, yet there is a general impression that this is effected only at the expense of a loss in the consumption of fuel. The object of the present paper is to show that smoke from steam boiler and other furnaces may be prevented with an economy in fuel, instead of causing a loss; and the experiments made by the writer, described in the present paper, appear to prove satisfactorily that, by judicious arrangement, cold air may be admitted into the furnace, so as effectually to prevent the production of smoke, and at the same time cause the gases given out from the furnace to produce a more intense heat in their combustion, and to that extent economize the consumption of fuel.

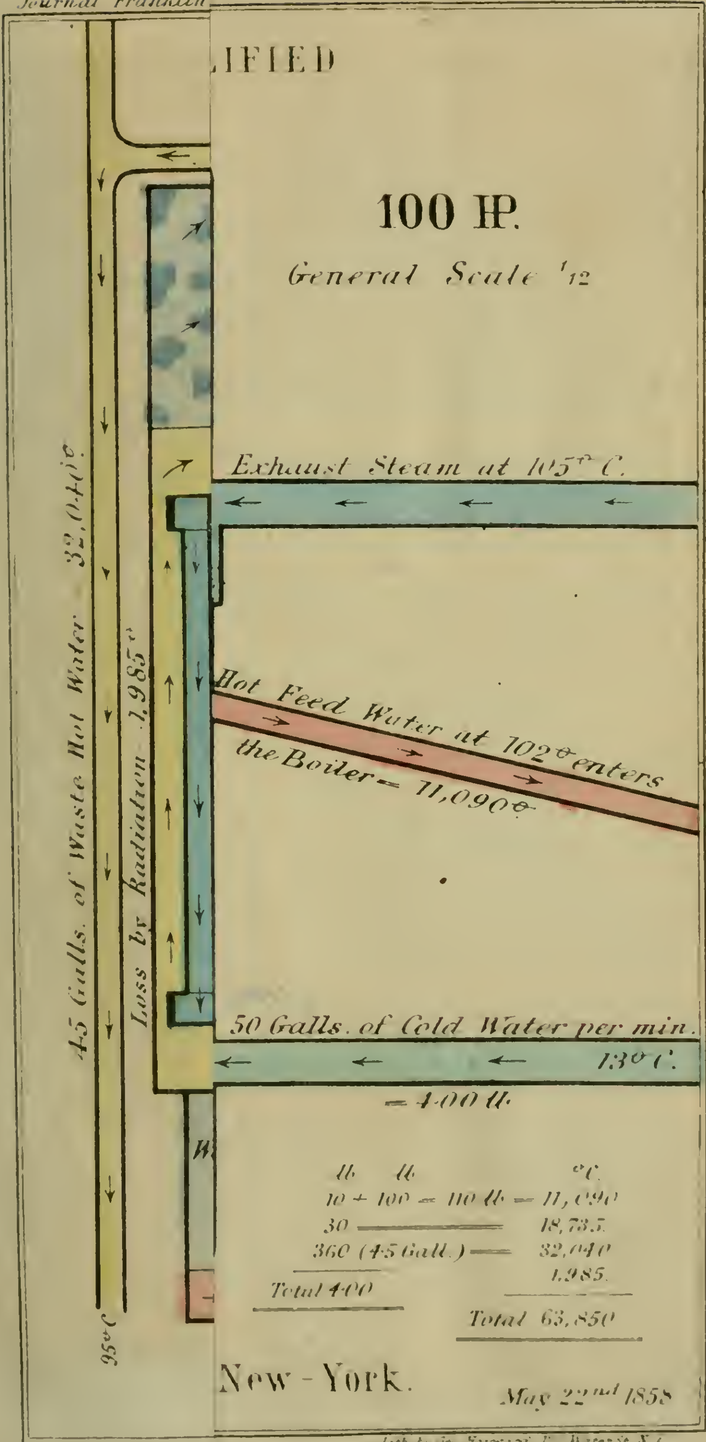
The air, to be most effectual for the prevention of smoke, should be admitted in such a position relative to the furnace as to cause the whole of the products of combustion to come under its influence; and it should be admitted also in such increased or diminished quantities as the varying amount of gases produced may require.

The boiler to which the apparatus described in this paper is applied is of the multitubular construction, a form that presents more difficulty to the prevention of smoke than the various kinds of flue boilers. This boiler is of 30 nominal horse power. The shell is 6 feet diameter by 14 feet long; the furnace is 2 feet 10½ inches diameter by 12 feet long, and is attached to the fire chamber, 1 foot 7 inches long; there are 35 tubes, 3¼ inches diameter, leading from this chamber. The fire-grate is 7 feet long, and the top of the bridge is 9 inches from the top of the furnace, and is level across the top.

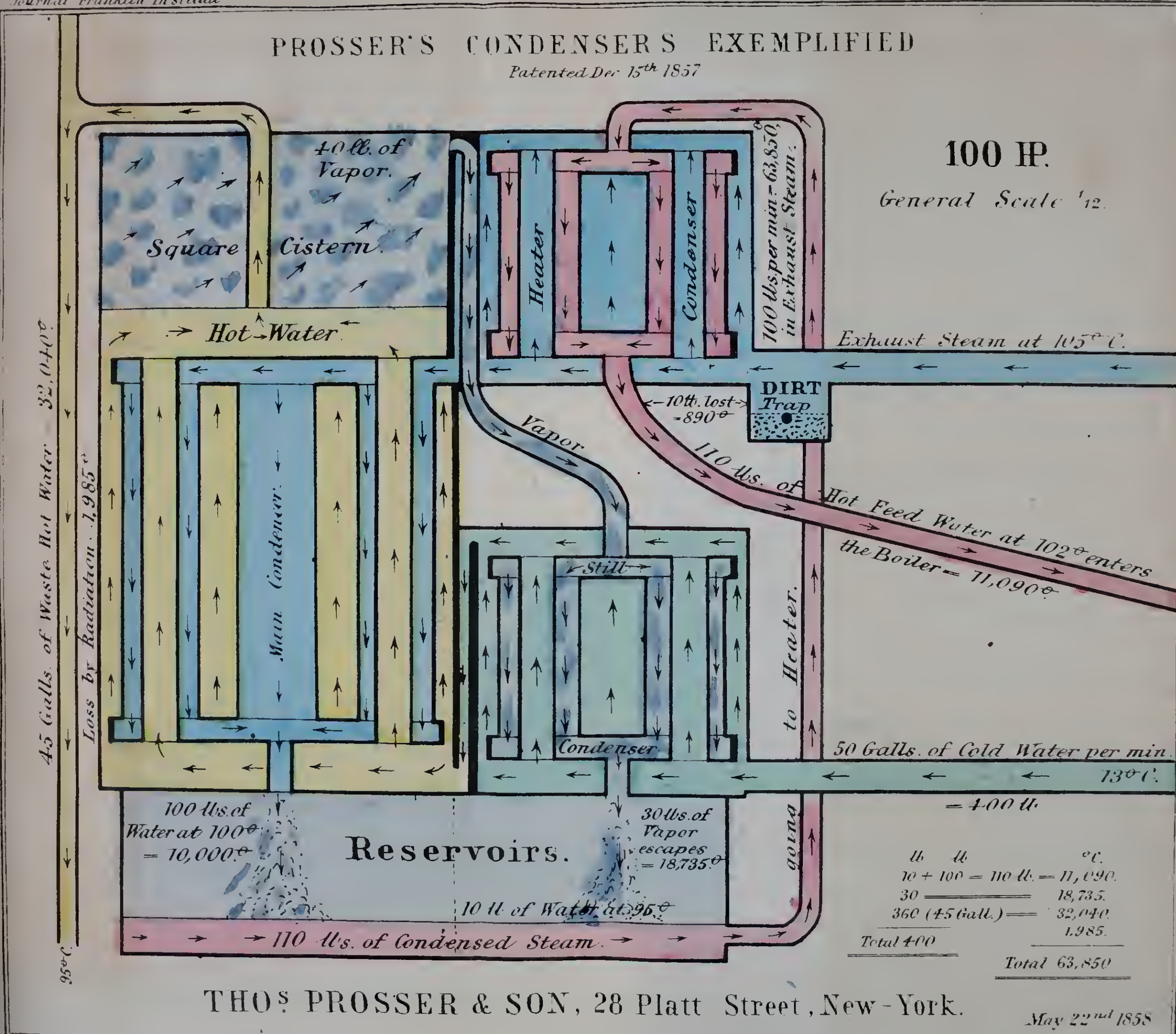
Between the shell of the boiler and the top of the furnace is fixed a vertical wrought iron tube, 7 inches diameter inside; this is placed directly over the furnace bridge, and through it air is admitted to act upon the products of combustion passing from the furnace over the bridge. On this tube is placed a self-acting apparatus, by which the admission of air is regulated. It consists of an outer casing, which surrounds a cylinder containing water, leaving an annular space, down which air passes to the tube. Projecting upwards from the centre of the cylinder is a guide rod, which receives a floating cylindrical chamber, closed at the top by a plate, which forms a valve cover to the annular air spaces. An opening is made in this plate, to receive a regulating valve, by which air is allowed to escape from the floating chamber, and thereby diminish its buoyancy.

The action of the apparatus is as follows:—When the furnace door is opened for firing, a chain, attached to it and passing over pulleys to a bell-crank lever connected to the cover of the valve, lifts it, together with the air chamber, above the surface of the water contained in the cylinder. When the furnace door is shut, the valve cover falls, until the air retained in the air chamber causes it to float upon the water, in

*From Newton's London Journal, April, 1858.



Lith by Geo. Stewart 12 Water St N.Y.



Lith. by Geo Hayward 120 Water St N Y

which position air is allowed to pass down to the furnace. The regulating valve is adjusted by means of a small screw, so that the valve cover may close or rest upon its seat in 5 or 10 minutes time, more or less, as may be required by the mode of firing adopted, and thus stop the supply of air to the furnace.

The advantages of this apparatus are considered to be, that the air, being admitted in a downward direction, does not beat the flame against the furnace plates and injure them, as is the case when it is admitted in an upward direction. The opening for admitting air cannot be choked up with dust or ashes from the furnace. Air is admitted at a part where the whole of the products of combustion are compelled to pass, and where they are most concentrated. The supply of air gradually diminishes from the time of firing, and ceases altogether when the supply obtained through the fire-grate is sufficient to produce complete combustion. The furnace fittings are as simple as those of an ordinary furnace, and therefore are not more liable to get out of order. The self-acting valve for admitting air is simple in construction, no packings or accurate surface fitting being required; and the apparatus is worked by the fireman without any extra duty whatever beyond that required for an ordinary furnace.

The results of the experiments made with this apparatus applied to the boiler described, have proved that smoke was effectually prevented by its use. During the experiments the process of combustion of the gases was observed through an opening made in the back chamber; and it was found that, immediately after firing, a dense black smoke was produced if the valve was closed, which was instantly replaced by a light white flame when the valve was opened, and so continued as long as the valve was opened to its proper extent; but if closed too soon, as was frequently done for experiment, dense black smoke was again produced. Similar results were observed at the chimney top, except that the transition from dense smoke to no smoke was not so instantaneous as in the chamber, on account of the length of flues to be traversed before reaching the chimney top.

A pyrometer has been attached to the boiler, for the purpose of ascertaining whether the use of this smoke-prevention apparatus was attended with an increased production of heat; and numerous experiments made with it confirm the view that a proper supply of cold air is attended with considerable increase of temperature, particularly immediately after the furnace is supplied with fuel.

—

Mr. Johnson showed the pyrometer that had been used in the experiments, with the regulating cylinder at work, and explained their action. He observed, that the general fear of proprietors of steam boilers that smoke prevention involved a waste of fuel caused a great impediment to the carrying out of smoke burning; and the present apparatus had been devised to meet this difficulty, since waste of fuel was not a necessary accompaniment of the principle, but simply showed a defect in the mode of carrying it out. The object of the pyrometer was to test more fully the result of the apparatus in economizing fuel. The alter-

nate experiments of opening and shutting the air valve always showed a rise of temperature after firing whilst the valve was open, which appeared conclusive evidence of improvement in the employment of the fuel, more heat being generated by the consumption of the same fuel, in consequence of its more perfect combustion.

The CHAIRMAN said, he believed it was generally admitted that the additional supply of air to consume the smoke could be introduced without loss of temperature if properly regulated; but the difficulty was to make the apparatus self-acting, and to insure it from getting out of order. The object might be effected without apparatus, by sufficient care in firing; but it was impracticable to obtain the constant care requisite on the part of the men. The plan described appeared to be well contrived for the purpose, from its simplicity of construction and working, and the principle of action was certainly a good one; it was similar to that of a plan described at a former meeting by one of their members, in which the air was admitted through a regulating apparatus in the fire-door.

Proc. Inst. Mech. Engineers, London.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED FROM APRIL 27 TO MAY 25, 1858, (INCLUSIVE,) WITH EXEMPLIFICATIONS.

APRIL 27.

258. MACHINE FOR WETTING PAPER; John A. Lynch, Boston, Massachusetts.

Claim—The combination of the wetting cylinder. handle, and roller, the whole constituting a new implement or machine by which the sheet on which the impression is to be taken can be dampened, and its superfluous moisture absorbed by passing the apparatus once over the sheet.

259. HARVESTERS; J. B. McCormick, Versailles, Kentucky.

Claim—The separator formed of the bar and rods, in combination with the adjustable rod, bars, one or more seat and reel, provided with concave beaters when the several parts are constructed.

260. PREPARING STEREOTYPE PLATES; John McElheran, Brooklyn, New York.

Claim—Producing a plate of fixed metallic types for printing from, by stamping letter dies in succession to each other into a plate made of, or coated with, such a substance as will readily take and preserve their impressions, and allow a stereotype or electrotype to be made thereof, either directly or by means of an intermediate plaster cast, whereby the ordinary process of setting and distributing the type is dispensed with, and but one set of types is used.

261. METALLIC SHOE FOR TRUSS BRIDGES; David H. Morrison, Dayton, Ohio.

Claim—The combination of metallic shoes or angle pieces with several parts of wooden trusses, in such manner that the cuts or gains made in the timbers of the trusses, against which the bearing surfaces on the shoe rest, are at right angles, or nearly so, to the fibres of the timbers, for the purpose of preventing the injurious effects of shrinkage, there being on every shoe at least three such bearing surfaces, one each for the chord, post, and brace.

262. MILL-STONE DRESS; Gabriel Natcher, Indianapolis, Indiana.

Claim—1st, The lines upon the upper portion of the inclined plane of the furrow. 2d, The curved or retarding lines upon the breast circle. 3d, The parallel or uniform lines upon the whole surface, running straight or at any desired curve. 4th, The combination and arrangement of the various parts making up the complete dress of the mill-stone.

263. MILL-STONE DRESS; Gabriel Natcher, Indianapolis, Indiana.

Claim—The application of the diamond in the production of the small lines in any required form upon the face of mill-stones for dressing the same.

264. METAL AWNING; Wm. C. Parisen, City of New York.

Claim—The metal plates or strips, so arranged that one may overlap the other, and be kept in proper position by guides, when said plates are used in connexion with toggles and arms, and a windlass, arranged so as to raise and lower, or fold and unfold the plates.

265. COTTON GINS; S. R. Parkhurst, City of New York.

Claim—The manner of connecting a ginning or card cylinder with a stripper, by combining with said cylinder and stripper the internal gear and pinion.

266. ENVELOPES FOR LETTERS, &c.; Charles Phelps, Salem, Massachusetts.

Claim—The application to a letter envelope of an opener therefor, said opener to be attached to, and part of, said envelope.

267. Convertible Extension Table; Michael Quigley, Watertown, Wisconsin.

Claim—Securing the leaf A, to the legs, and leaf E, for the purpose of performing an extension table, the leaves of which are folded in a perpendicular position. Also, the arrangement of the case as constructed with the inclined brackets, for the purpose of completing the bed of the table when required.

268. Churn; G. S. Rarey, Columbus, Ohio.

Claim—Operating or giving the dasher a reciprocating rectilinear motion from the driving rotary wheel, through the medium of the pinion, crank pulley, connecting rod, segment, and rack bar.

269. Printing Press; Thomas S. Reynolds, Athens, Georgia.

Claim—1st, The rotating segment, in combination with the intermittingly rocking bed, the segnent having a continuous rotary movement while the bed rocks to and from the segment, and remaining, while in a vertical or nearly vertical position, stationary a sufficient length of time to have the form properly inked. 2d, The inking device formed of the fountain and the roller, operated by the cams, levers, bar, and the frame, with the weight and cam arranged to operate conjointly with the segment and bed, so that the form will be properly inked during the "dwell" or the cessation of the movement of the bed. 3d, The counterpoises, when used in connexion with the springs, whereby the counterpoises may be graduated as circumstances may require. 4th, The frame attached to the shaft, which is fitted in the bars, and having the spring and rod attached.

270. Fly Trap; William Riley, Madison County, Mississippi.

Claim—The shape of the trap, the sliding drawer, the manner in which the triggers are made, the tube which prevents the flies from returning from the bag to the box, the bag and circle by which the flies are destroyed, by detaching the bag and circle from the box, and the glass on the back part of the box introduced to give light, and lead the flies away from the place of entrance to the bag.

271. Bedstead Rail; Charles Robinson, Cambridgeport, Massachusetts.

Claim—An elastic support bedstead rail, composed of the notched rail piece, stretched elastic band, and confining or cap strip.

272. Apparatus for Raising Leather from Vats; C. E. Robinson and L. D. Sanborn, Concord, N. H.

Claim—The manner of taking leather out of tan vats, by using hooks or a movable frame with copper rods, to be placed in the bottom of each vat before the leather is placed therein, or any way similar to the same, by which all of the leather and bark can be taken out at one time.

273. Steam Valve; Thomas Scott, San Francisco, California.

Claim—The reciprocating or revolving valve, whereby the steam enters at or near the axial centre of the valve, and is then conveyed obliquely through the valve to the cylinder, the valve and hollow stem united and acting as a rock shaft or centre.

274. Constructing Coffins; Isaac C. Shuler, Amsterdam, New York.

Claim—1st, The combination of the self-securing frame with the catch on the false head-piece, operated by the spring as a cover over the joints, after soldering the top of a metal coffin. 2d, The arrangement of placing inside of a metal coffin, near the upper edge of the walls, the iron frame, or its equivalent, fastening it securely, for the purpose of shaping permanently the upper part of the body of the coffin exactly like the braded frame at the bottom, and as a means of securing a close joint on the top for soldering the same to the walls of the coffin; also, for the purpose of supporting the top on a line sunk somewhat below the upper edge, sufficient to leave an extension or projection of the metal all around the upper edge of the walls above the coffin top, when fixed in its proper place. This extension of the metal which shows itself above the frame, is made expressly for the purpose of soldering on the coffin top without using the lap or lock joint. 3d, The false head piece and the spring, or its equivalent.

275. Paddle Wheel; Nathan Smith, Berwick, Louisiana.

Claim—1st, The fitting of the two paddle hubs with their arms to the shaft, and the attachments of the buckets to the arms, in such a manner that either hub may be permitted at pleasure to be turned upon the shaft by the pressure of the buckets upon the water, for the purpose of adjusting the buckets obliquely in either direction to the shaft, and of returning them to a position parallel with the shaft. 2d, The employment of the bolts and a system of levers and sliding collars, in combination with the loose paddle hubs and fast hubs, with their corresponding holes, for the purpose of liberating the hubs from, and securing them to, the shaft, to permit and secure the adjustment of the buckets.

276. Bedstead; Noah W. Speers, Cincinnati, Ohio.

Claim—1st, The bent posts, in combination with the clamp, or substantially equivalent device, by which they are connected at top. 2d, The outside inclining rail for supporting the posts and fastening the various parts together. 3d, The construction and arrangement of the corner fastening, in connexion with the rails and posts.

277. Leather Slicker; H. Lee Sultzbach, Marietta, Pennsylvania.

Claim—The arrangement of the bolt with the blade, operated by the knob, spring, or its equivalent.

278. Washing Machine; Charles M. Swany, Richmond, Indiana.

Claim—1st, Such a construction and arrangement of the disk and rubber case with the tub, that the disk and rubber case are free to move in opposite directions simultaneously. 2d, The manner of arranging the rubbers or ribs upon the horizontal rubbing surfaces of the disk and rubber case, for the purpose of keeping the clothes in place during the process of washing.

279. Drawer for Closets, Bureaus, &c.; Henry R Taylor, Roxbury, Massachusetts.

Claim—The sliding pieces, or their equivalents, connected with the drawer.

280. Washing Machine; Edmund Tharp, Cincinnati, Ohio.

Claim—The arrangement and combination of the vertical rotating disk and quarter spherical trough.

281. Mill for Grinding Paint; Chauncy Thomas, West Newbury, Massachusetts.

Claim—The combination of the force (or its equivalent,) with the grinder or mill for grinding paint. Also, the mode of combining the piston with the mechanism or means of elevating and depressing it, that is to say, by such a mechanical device or devices as will not only allow the piston to be elevated out of the pump, but swing laterally out of the way or beyond the mouth of the pump, when receiving the material to be ground.

282. Straw Cutters; John Tittle, Johnstown, Pennsylvania.

Claim—The arrangement of the knife with its arms or levers, when connected for operation conjointly

with the feed rollers, pressure bar, and feed box. Also, in combination with the lever, pawl, bar, and curved portion, the sliding bar.

283. Smut and Grain Cleaning Machine; Jeremiah Tobin, Newark, New Jersey.

Claim—1st, The blast passage formed by the cylinder and case, in connexion with the rotary basin, or an equivalent device, for the purpose of properly presenting the grain to the action of the blast in said passage. 2d, The screw, fan, blast passage, cylinder, and case.

284. Frames or Caissons of Breakwaters, &c.; Edward H. Tracy, Brooklyn, New York.

Claim—Constructing the frames of breakwaters with longitudinal compartments, two or more, the inner compartment or compartments being provided with a flooring or bottom, and the outer compartment being open at its lower end.

285. Warm Air Registers and Ventilators; Edward A. Tuttle, Brooklyn, New York.

Claim—A warm air register, viz: the frame having lugs and recesses, the end piece provided with lugs for the reception of screw, the ledge or step and openings for the leaves, when combined with a mechanism for operating the leaves.

286. Brick Machine; Stephen Ustick, Philadelphia, Pennsylvania.

Claim—1st, The combination and arrangement of the filling box, scraper, and guides, or their equivalents, as an improvement on the filling box, in the machine for which Letters Patent were granted to me, September 8, 1857. 2d, The piston and plunger, the plunger being operated by the spring, or its equivalent. 3d, The grooves in the facing of the piston, and the grooves in the facing of the plunger. 4th, The curved piece, in combination with the segmental piece and pin.

287. Machinery for Supplying Tenders with Water at Railroad Stations; Benjamin M. Van Derveer, Clyde, New York.

Claim—The application of the pipes to water-houses of railroad stations, or to any other place for the same purpose. Also, the combination of these pipe heads and pipes, acting upon one box or nipple.

288. Brick Machine; I. Z. A. Wagner, Philadelphia, Pennsylvania.

Claim—1st, Moulding and pressing bricks by means of the two rotating wheels, and hopper, or its equivalent, the wheels having their peripheries notched or recessed. 2d, Having the hopper formed of two parts, in connexion with the plates, so that the sides of the hopper and the plates may be adjusted to the wheels to prevent the escape of clay between their ends and the sides of the hopper and plates. 3d, The pin, operated from the wheel by the rod, with its wedge and spring, where said pin is used in connexion with the moulding and pressing wheels and hopper, or its equivalent.

289. Apparatus for Generating Carbonic Acid Gas; Thomas Warker, City of New York.

Claim—The bottle and chamber, connected together and provided with the ball valve, so that communication is obtained between the chamber and bottle by the tilting or inclining of the same, when these parts are combined with, and applied to, the receiver.

290. Apparatus for Damping Paper; C. A. Waterburg, City of New York.

Claim—1st, The application of one or more tablets when kept in a wet state, for the purpose of taking copies of written letters, and other documents. 2d, The use of wood, or other substances, when used in copying tablets. 3d, The use of the case, or substitute, which contains the water tablets, when used in oonnexion.

291. Folding Mattress; William Wells, Harrisburgh, Pennsylvania.

Claim—The inclined seats of the hinge, on which seats the hinge is fastened, for the purpose of folding the mattress.

292. Washing Bottles; Wm. B. White and John Whitford, Saratoga Springs, New York.

Claim—1st, The series of devices, including the pulleys, the clutches, the collar, the radial arms, the springs, and the grippers, whereby the bottle is rotated in one direction, while the chain or brush, or other devices for cleansing the inside of the bottle, is rotated in the other. 2d, The use of a cam (like that of a pocket knife blade) on the hinged end of the rod, whereby the same tends to remain in a line continuous with the main spindle, or at right angles, or any other given angle thereto. 3d, The use of the spring on the bar, so as to adapt the same to different depths of bottles.

293. Fire-box of Locomotive Engine Boilers; Ross Winans, Baltimore, Maryland.

Claim—The combination of a fire-box having one grate and an upper and lower feeding door, so arranged as to adapt it to burning either wood or coal, or a mixture of both, as fuel, with a locomotive tubular boiler having a steam blast draft.

294 Fire-box of Locomotive Boilers; Ross Winans, Baltimore, Maryland.

Claim—The construction of the fire-box in such manner that its entire rear side can be opened and closed.

295. Boilers for Locomotive Engines; Ross Winans, Baltimore, Maryland.

The chief object of my improvement is to adapt the locomotive to the burning of coal as a fuel, without impairing its efficiency in other respects.

Claim—The method of constructing the fire-boxes of locomotive engines of diminished weight, but of undiminished strength, by staying the crown sheet directly to the exterior shell, by means of through bolts, and contracting the space between the two, so as to get rid of the disadvantages that would result from the excessive weight of a fire-box of the ordinary construction, of sufficient capacity to burn coal as fuel with economy.

296. Furnaces of Locomotive Boilers; Ross Winans, Baltimore, Maryland.

Claim—The construction and arrangement of the locomotive engine, so as to obtain a fire-box of greater width than the space within the main frame.

297. Making Metallic Nuts; S. W. Wood, Washington City, D. C.

Claim—A solid female die with a sliding hook for discharging the finished nuts.

298. Raking and Delivering Attachment to Harvesters; W. A. Wood, Hoosick Falls, New York.

Claim—1st, Giving the rake its reciprocating, and rising, and falling motion, by means of a single traveling belt or chain without any other appliances. 2d, In combination with a uniformly moving automatic rake, a delivering apparatus, which is set in motion by the conductor, and butts off the gavel, and returns for the next succeeding operation.

299. Cotton Gins; James N. Wilson and George W. Payne, Memphis, Tennessee.

Claim—The adjustable hinged hopper and rib frame, in combination with the belt arrangement, by which

the side frame can be adjusted, raised, or lowered without stopping the motion of the machine. Also, the projections on the ribs. Also, the toothed feeding cylinder, in combination with the inclined grate partition and hinged cover.

300. Corn and Cob Mill; Benjamin Winter, Buckingham C. H., Virginia.

Claim—The combination of the adjustable bridge tree, rollers, inclined planes on the base of the revolving cone, and horizontal stepped disks, for action together.

301. Gang Ploughs; G. W. N. Yost, Cincinnati, Ohio.

Claim—1st, The torsion spring, in combination with the plough share, for the purpose of allowing a single share to swing backward in passing stones, and then automatically to replace itself in working position, thus avoiding the breaking of the plough or stopping of the team. 2d, The use of the team guide for managing the team, so as to obviate the necessity of employing many drivers. 3d, The use of the team shade, in combination with the team guide, for sheltering the team from the heat of the sun or from rain.

302. Washing Machines; Henry Yost, St. Louis, Missouri.

Claim—The traversing rubber in connexion with the yielding rack over the surface of the water.

303. Sugar Mills; Frederick E. Dake, Assignor to self and Thomas Hunt, Indianapolis, Indiana.

Claim—The combination and arrangement of the lever frame, sliding weight, and rollers, with the bed plate.

304. Fishing Net; Thomas Hall, Assignor to Thomas Hall & Co., Gloucester, Massachusetts.

Claim—The employment of a bag in combination with the seine.

305. Nail Machine; H. Greene and W. J. Gordon, Assignors to Henry Greene, aforesaid, Philadelphia, Pa.

Claim—1st, The combination of the carrying chains and the rack chain with the nail rod holder, to move the rods laterally along the anvil, and turn them simultaneously. 2d, The arrangement of the front edge of the anvil obliquely to the direction of the movement of the carrying chains, for the purpose of causing the nails to be drawn from head to point in the foregoing process.

306. Adjustable Seats for Vehicles; George J. Lucas, Assignor to self and John Lucas, Poughkeepsie, N. Y.

Claim—The connexion of the two seats, by means of levers and links.

307. Bending Mould-boards for Ploughs; Benjamin Pitcher, Assignor to self, Wm. Tobey, and John Anderson, Peoria, Illinois.

Claim—The combination of the stationary die with the movable die hinged to the stationary, so that the heated metallic plate subjected to their action is, during the process of being bent into shape, gradually compressed and drawn from its inner to its outer edge, and retained under compression until the entire bending is completed.

308. Continuous Priming for Fire Arms; Daniel G. Rollin, City of New York, Assignor to George G. Martin, Brooklyn, New York.

Claim—The continuous priming, to be combined with, and operating in, fire arms, by means of an independent cut-off.

309. Gas Metres; Thomas Shaw, Assignor to self and C. S. Paterson, Philadelphia, Pennsylvania.

Claim—The construction of the oscillating drum, in such a manner as to contain the sealing fluid or seal, with lever, attached to said drum, the whole for operating the valve by the oscillation of the drum, in combination with the inlet and outlet passages.

310. Ships' Capstans; James R. Taylor, Assignor to Wm. Kiddy, City of New York.

Claim—As of my invention, the freely revolving plate for carrying the intermediate gear wheels, in combination with the capstan head and with the shifting stop.

311. Syphonic Radiator; Charles Williams, Assignor to self and Charles J. Shepard, Brooklyn, New York.

Claim—The syphonic circulating and radiating pipes, formed with two or more vertical, or nearly vertical, limbs, attached at their upper ends to the shell or casing of the furnace, and connecting their lower ends to each other.

312. Ovens for Cooking Stoves; James Easterly, Albany, New York.

Claim—The construction of stove ovens, or analogous structures, by surrounding them with double outside walls, containing in the chamber formed within them some slowly conducting and radiating solid material, to absorb heat communicated on the outside of the chambers, and radiate the same internally.

Re-Issues.

1. Sawing Mill; Wm. M. Ferry, Ferrysburgh, Michigan; patented July 21, 1857; re-issued April 6, 1858.

Claim—1st, The particular means and their arrangement. 2d, Effecting, by means of an eccentric, the combination of the log carriage and automatic reversing mechanism, thereby rendering the saw mill capable of self-feeding and self-gigging. 3d, So adjusting the gauging, that its hinge or pivoted joint, and its opposite end or terminus shall always be at the same and equal distances from the set shaft. 4th, The application of the adjustable self-fastening trip to a saw mill, which operates with a continuous rapid motion backward and forward, in combination with the vibrating reversing stop.

2. Rollers for Window Shades; Jacob B. Bailey, City of New York; patented February 16, 1858; re-issued April 13, 1858.

Claim—The combination of india rubber, or equivalent substance, with a window shade roller or its pulley.

3. Steam Boilers; Wm. M. and J. B. Ellis, Washington City, D. C.; patented September 29, 1857; re-issued April 13, 1858.

Claim—1st, Connecting the water legs, extending from the front to the rear end of the boiler, continuously to the shell of the boiler at the point of the greatest horizontal diameter of the boiler. 2d, Interposing perforated plates between the flanches of the water legs and the shell of the boiler.

4. Grass Harvesters; Jonathan Haines, Pekin, Illinois; patented September 4, 1855; re-issued April 13, 1858.

Claim—In combination with a main frame, a loose cutter bar or finger beam that projects laterally from it, and so hung to the frame of the machine as that in being dragged over the ground, it shall receive all its vertical movements solely from the undulations of the ground over which it is drawn. Also, the bars or rods for connecting the beam to the main frame. Also, the combination of two hinged or jointed rods or bars, for allowing the cutter or finger bar or beam, its vertical, but restraining its lateral motion.

5. PRINTING MACHINE CALLED THE POWER PRINTING PRESS; Isaac Adams, Boston, Massachusetts; patented March 2, 1854; re-issued April 13, 1858.

Claim—1st, Giving the bed its proper periods of motion and rest, and producing impressions, by means of the combination consisting of the crank, the pitman, the declension lever, and the toggle joints 2d, The mechanism for giving the proper periods of motion and rest to the frisket carriage, and each and all the parts attached to it, by means of the combination consisting of the arms, the rocking bar, the inclined plane by which said bar is disengaged, the shaft, and the crank. 3d, The combination of one or more feed frames with the frisket or friskets, or mechanism for receiving the sheets to be printed. 4th, Securing against the platen the sheet to be printed, whereby it is not only kept steady and prevented from bagging, but is also, after the production of an impression upon it, separated from the types in a proper and safe manner. 5th, Constructing the pitman, the bearing surface, the shoulder, and the joint, consisting of its essential characteristics, so as to allow said pitman to be operated. 6th, Producing the impressions, the treadle, or its equivalent, to prevent impressions being taken or produced while other parts of the press are in motion, whenever such prevention may be desirable. 7th, The combination of the double frisket carriage, the bed platen, and the rollers for inking the type, with two sets of inking mechanism. 8th, The combination of the platen, the bed, and distribution cylinders. 9th, The combination of a crank with the carriage, for the purpose of carrying the inking rollers over the form, and for giving the friskets their proper motions and periods of rest. 10th, The mode of constructing the winter or bottom bar, or any equivalent device, by which inconvenient height in the machine is avoided—said winter being made with a ledge or shoulder near its lower part, upon which the toggle joints are sustained. 11th, The combination of the fountain with one or more distribution cylinders and a traveler, the same being for the supply and distribution of the ink. 12th, Placing the apparatus for the supply and distribution of the ink, so that the distribution cylinders rest over, or nearly over, the fountain—the roller which takes the ink from the fountain roller being placed between the fountain and the cylinders. 13th, The mode of laying the ink upon the types by passing the rollers between the bed and platen, said rollers being brought to a stand in their horizontal movement, for the purpose of receiving their supply of ink from a cylinder or cylinders. 14th, The mode by which the nuts, which sustain the impression, are brought to their proper positions and secured there—that is, by the hoops, set-screws, and pins. 15th, The mode of producing the impressions, by means of toggle joints applied to the under or reverse side of the bed. 16th, The combination of the rocker shaft and the levers with the bed, the same being for the purpose of keeping the bed level.

DESIGNS.

1. COOKS' STOVES; G. W. Pittock, G. G. Richmond, and C. Phelps, Troy, New York; dated April 6, 1858.

2. SCREENS FOR STEAM PIPES, &c.; James L. Jackson, City of New York; dated April 13, 1858.

3. SCREENS FOR STEAM PIPES, &c.; James L. Jackson, City of New York; dated April 13, 1858.

The claims on the above, are for the several shapes, forms, ornaments, and configurations.

MAY 4.

1. LAMPS; L. Bailey, Charlestown, and R. Thayer, Boston, Massachusetts.

Claim—1st, The arrangement of the annular reservoir within the case, so that both the inside and the outside drafts of the flame may be supplied up through the base and pedestal, and in their passage cool all sides of the reservoir. 2d, The button, when made of concavo-convex form, and of the proper dimensions, so as to throw the air that passes up through the central passage down on the flame, and at the same time permit the flame to rise vertically instead of spreading it laterally as usual. 3d, The combination of the revolving cap, wick tube, with or without the button, and the annular reservoir, arranged relatively with each other, and used in connexion with the case, the hollow pedestal, and base.

2. SHELTERING FROM DUST THE LOWER CARRYING PULLEY OF BAND SAWS; James Balla, Richmond, Indiana.

Claim—The shields or guards placed over the lower pulley, when constructed and arranged relatively with the straps of said pulley.

3. STEAM ENGINES; Daniel Barnum, Jersey City, New Jersey.

Claim—Combining with an air pump of a marine engine an independent or separate suction pipe, connecting the hold of the vessel with the air pump directly, and not through the channel way or condenser.

4. MACHINE FOR BENDING WOOD; Thomas Blanchard, Boston, Massachusetts.

Claim—The particular means employed for thus bending the wood in the required form—that is to say, the employment or use of the rotating mould with the strap attached, in combination with the sliding pressure bar, provided with the adjustable slide or stop, the outer end of the strap being attached to the bar or box, whereby the strip may be bent in regular or irregular curved form, with the ends adjoining each other for the manufacture of picture and slate frames, chair bottom hoops, and similar articles.

5. MACHINES FOR HULLING RICE; Francis and Lodowick Burdick, South East, New York.

Claim—The peculiar dress in our horizontal stone mill, composed of the frustrum of a cone and its corresponding concave.

6. RAILROAD CAR COUPLING; W. H. Burridge and N. A. L. Post, Cleveland, Ohio.

Claim—Making the fulcra of the jaws forward of, or more towards, the centre of the coupling bar or link, than those parts of the jaws which catch the head of the link, so that the draft upon the link has a tendency to close the jaws, and, in combination with vibrating jaws having their fulcra, the peculiar construction of the link bar, by which the said link connects the couplings when the cars are run together, and by which they uncouple or disconnect themselves when one of the cars is thrown from the track, or the link vibrated upon a given angle.

7. MACHINE FOR MAKING HORSE SHOE NAILS; Tisdale Carpenter, Providence, Rhode Island.

Claim—1st, The machine for making horse shoe nails, consisting essentially of the revolving die table, arm, carrying the swage and shear, the carriage with its swage. 2d, The receiving box with its retaining spring. 3d, In combination with the table, the guide.

8. WATER CLOSET; Wm. S. Carr, City of New York.

Claim—The concave ring or cup screwed on to the hollow column, when this is used for passing the rod to the lever of pan water closets.

9. SEED PLANTERS; James Charlton, Alleghany, Pennsylvania.

Claim—1st, The rings with their lugs, projecting studs, and heads, in connexion with the strips and cylinder, for the purpose of enlarging or contracting the seed chambers, and agitating the seed in the hopper. 2d, The arrangement of the flexible rods, axle, yoke, lever, and strip, with notches.

10. Revolving Fire Arm; Samuel Colt, Hartford, Connecticut.

Claim—In combination with a central pin, which is inserted from behind to admit of readily taking out and replacing the rotating breech, and which is feathered or otherwise fitted to the central bore of the rotating breech so as to turn therewith, and which passes entirely through the central bore of the said rotating breech, and into the framing in front for support, the making of the rear end or head of the said central pin with ratchet teeth, or the equivalent thereof, to be acted upon by the mechanism for turning and holding the rotating breech.

11. Nut Machine; Richard H. Cole, St. Louis, Missouri.

Claim—The use of a traversing die, whereby the nut blank is first pressed and prepared on the blank surface of the said die, and afterwards punched and finished over a hole in the said die.

12. Brick-Kilns; John W. Crary, New Orleans, Louisiana.

Claim—1st, The peculiar arrangement of constructing the furnaces, so that by means of the arches, and constructed of brick, or other argillaceous substance, intermediate supports of grates, or otherwise, for the fuel are rendered unnecessary. 2d, The arrangement of auxiliary ash-pits or air chambers, with main air chambers or ash-pits and arches, formed by setting the bricks zigzag and alternately diagonal. 3d, Constructing the brick arches when the bricks are "set," so that the horizontal area of their interior chamber shall be greater than that of the throat of the furnaces. 4th, The zigzag and alternately diagonal setting of the brick throughout the kiln. 5th, The arrangement and constructing of auxiliary end arches and furnaces, in combination with the main side arches. 6th, The arrangement of vertical flues and horizontal passages in the wall, in combination with the partly open top and the furnaces.

13. Feeding Device for Cross-cut Sawing; Jeremiah Darling, Cincinnati, Ohio.

Claim—The reciprocating table, suspended at one end and supported by rollers at the other, to facilitate the operation of cross-cut sawing.

14. Railroad Car Springs; Andrew M. De Hart, Reading, Pennsylvania.

Claim—The combination of the semi-elliptic plate springs, as arranged with the box, press block and connecting rod.

15. Ring Bolt; George W. Devin, Ottumwa, Iowa.

Claim—The slide bolt, provided with the spring and ring, and secured to the door, in combination with the socket or nosing, provided with apertures to receive the shackle of a padlock.

16. Governing Lateral Motion of Carriage in Gigging Back in Circular Sawing Machines; Wm M. Ferry, Jr., Ferrysburgh, Michigan.

Claim—Providing a short auxiliary rail alongside the inner rail of the log carriage, and opposite the oblique inclined gauge bar, and furnishing the carriage with an auxiliary wheel which has a vertical axis, and having said wheel come in contact with and run against the side of the auxiliary rail, and thereby prevent any lateral movement of the carriage other than that necessary to prevent the log rubbing against the face of the saw, and heating the same, and also avoid the scratching of the face of the board by the teeth of the saw.

17. Casting Car Wheels; David Finley, Champlain, New York.

Claim—The heating of the knowel and cope of the flask, and parts of the mould contained therein, separately from the chill ring, then putting the whole of the flask and mould together, and either placing it in a box, or its equivalent, and surrounding it with non-conducting material within the said box, and after pouring the metal into the mould, burying the whole in a pit, or omitting the box surrounding the flask and mould with the non-conductor in the pit.

18. Harvesters; R. H. Fisher, Claremont, New Hampshire.

Claim—1st, Mounting the main frame on the axle, so that the frame may slide freely thereon, in connexion with the spirally slotted collar placed on the axle, and receiving a pin attached to the axle, whereby the mechanism which operates the sickle may, when desired, be readily thrown in and out of gear with the driving wheel. 2d, Raising and lowering the sickle by means of the pulley placed loosely on the axle, and the chain attached to the back part of the main frame and to the pulley. 3d, Attaching the finger bar to the main frame, by overlapping the end of the finger bar and the lower end piece of the main frame, the finger bar resting on a semi-spherical projection on the end piece, and adjusted by the screws.

19. Vapor Lamp Burners; C. A. Green, Boston, Massachusetts.

Claim—The combination of the hollow spur, susceptible of being turned in either direction, and having slits or apertures formed in it with the cap, through which similar slits or apertures extend, and for the purpose of regulating the jet or jets of flame by the turning of the said spur.

20. Washing Machine; Ashman Hall, Danville, New York.

Claim—1st, Constructing the slats or bars which form the rubbers with spiral grooved and ridged surface. 2d, In arranging the spiral grooves and ridges formed on the slats, so that they incline in opposite directions in each succeeding slat. 3d, The combination of the dipping scoop with the vibrating rubber.

21. Braces of Eave Troughs; W. H. Henderson, Franklin, Indiana.

Claim—The arrangement of the brace in the trough and with the pins, and also this arrangement in combination with the strap for the better security of the trough.

22. Billiard Table Cushions; George W. Holman, City of New York.

Claim—The whalebone facing to the elastic cushions of billiard tables.

23. Quartz Crushers; Wm. H Howland, Sacramento, California.

Claim—1st, The arrangement and combination of the annular mortar and pestles. 2d, Having an annular feeding chamber between the upright and the inner surface of the cylinder.

24. Seed Planters; James J. Johnson, Alleghany City, Pennsylvania.

Claim—1st, The arrangement of the flexible bottoms, springs, rod, and division piece, in the seed chambers. 2d, The arrangement of the depositing tube, with tugs, share, rod, lever, and sliding gate.

25. Lamps; Edward F. Jones, Boston, Massachusetts.

Claim—Securing the chimney to the removable cap, and both of them to the lamp, by means of a spring.

26. Revolving Fire Arm; B. F. Joslyn, Worcester, Massachusetts.

Claim—Revolving the cylinder by means of a slotted spring clutch cylinder, operated by a lever.

27. Smut Mills; John C. Kelly and A. Frost, Edinburgh, Indiana.

Claim—1st, The arrangement of the hopper as constructed with the air passage. 2d, The peculiar arrangement of the scourer as constructed with the air passage, connecting spout, and fan, for the purpose of separating the smut from the wheat.

28. Seeding Machines; James F. Kierstead, Laporte, Indiana.

Claim—The reciprocating bar provided with the pendents, and the adjustable perforated bar, in combination with the bar, the parts being arranged relatively with each other and the discharge openings.

29. Corn Husker; Charles N. Lewis, Seneca Falls, New York.

Claim—The combination and arrangement of the lever, tilting arm, blade, and yielding gauge.

30. Mowing Machines; H. Marcellus, Amsterdam, New York.

Claim—Attaching the main frame of the machine to the axle by connecting the frame, by means of journals, to the sleeve or collar, which is placed loosely on the axle.

31. Punching Metallic Tubes; B. Mackerley, New Petersburgh, Ohio.

Claim—The combination of the mandrel, the punch, and the detent. Also, the gouge-shaped wedge, in combination with the mandrel and the punch.

32. Automatic Lathe; John McNary, Brooklyn, New York.

Claim—The sliding or traveling lathe heads, between which the stick to be turned is centred, in combination with the rotary cutters, so that the stick will be gradually fed to the cutters until the desired form is given it, and then its feed motion stopped and the stick rotated, so that a perfect symmetrical form may be given it. Further, giving the feed and return motion to the stick to be turned, and also rotating the same from the cutter shaft, by means of the screw on said shaft, worm wheel on shaft F, in connexion with the gearing, screw, worm wheel, and the screw on shaft, G, together with the gearing, through the medium of which the screw shaft I, is rotated, the above parts being used in connexion with the lever and the catch, rod, and with the pawls, actuated by lever and pinion.

33. Steam Boilers; James Montgomery, Brooklyn, New York.

Claim—The arrangement of the series of tubes placed vertically, or nearly so, between an upper and a lower, and connecting vertical water spaces, when said lower water space is made directly over the fire chamber, and the draft is returned over said lower space and among the vertical tubes. Also, the arrangement of the shield plate, in combination with, and interposed between, the crown sheet of the furnace, and the lower ends of the series of water tubes.

34. Check for Screw Cutting; R. Nuttall and John Kirkpatrick, Alleghany, Pennsylvania.

Claim—1st, The projection on the movable die seats, and the transverse slot or notch in the removable cutting dies, the one being adapted to the other. 2d, The use of the troll plate, and operating in connexion with the die seat and die.

35. Fluid Metres; Wm C. Perrine, City of New York.

Claim—Making the measuring chambers gradually larger in each direction, from near the middle where the exterior edges of the diaphragms are fastened, so that the diaphragms will be held by the water or remain in contact with the part so enlarged, until it is drawn away by the centre of the diaphragms or by the plates which move and traverse with the centre of the diaphragm. Also, the recesses in the ends of the measuring chambers, in combination with the plates arranged to work in them (the said recesses). Also, the openings in the plates, provided with the valves, or such equivalent openings as will answer the same purpose. Also, making recesses with their sides parallel in the flanches, so that that portion of the diaphragm in or opposite to said recesses may vibrate a very little between the measuring chamber and the line where it is bound or held firmly by the flanches.

36. Hoisting Machines; Reuben Packard, Rockland, Maine.

Claim—The circular plate, or its equivalent, in order that it may be turned easily and held in any desired position by pawls, or their equivalents, for the purpose of sustaining any combination of mechanical powers constructed thereon, for drawing or lifting heavy weights, or their equivalents.

37. Cast Iron Pipe; C. Pomroy, Pottsville, Pennsylvania.

Claim—A cast iron pipe chilled inside, as a new article of manufacture, for the purpose of conveying fluids impregnated with or containing substances which soon destroy iron pipes "which are not so chilled."

38. Arrangement of Gas Engines; John C. Fr. Salomon, Baltimore, Maryland.

Claim—1st, Arranging all the parts necessarily employed in generating and working gaseous vapor within a tight chamber, which is supplied with oil, hot air, or other suitable heating medium. 2d, The employment in combination with the above named tight chamber, of the combined arrangement of fire flues, smoke stack, circulating coil, boilers, vapor chest, and cylinder.

39. Cements for Roofing; R. Simons, Rockford, Illinois.

Claim—The composition of ingredients when compounded.

40. Device by which the width of the Bolt checks the Feed in Shingle Machines; A. C. Sawyer, Clinton, New York.

Claim—The use of a lever hanging by the side of the saw, in such manner that the bolt in running under it will raise or lower it and adjust the travel of the carriage.

41. Sewing Machines; E. Harry Smith, City of New York.

Claim—Arranging the cranks and connexions to the needle and shuttle, whereby the differential movements are imparted to the needle and shuttle.

42. Method of Ventilating and Excluding Dust from Railroad Cars; A. B. Spencer, Rochester, N. York.

Claim—The revolving wet sheet or endless apron (passing through water), for the purpose of cleansing and purifying the air as it passes into the car—which sheet or apron, together with the tank containing the water, and that portion of the bottom whereon it rests, I claim as a partition by which I divide the instrument into two complete ventilators, either of which will act as the downward ventilator, while the other always acts simultaneously in the opposite direction.

43. Gas Generators; Wm. N. Taylor, Philadelphia, Pennsylvania.

Claim—1st, The combination of the retort with a series of movable partitions connected so that all can be taken out together, and so arranged as to divide the retort into a series of chambers through which the gas

circulates in its passage from the lower chamber to the discharge pipe. 2d, Dividing these chambers by means of punctured diaphragms, or their equivalent, in order to retard the passage of the gas, and bring the entire volume in contact with the heated metal.

44. Lamp Attachment for Preventing Smoke, &c.; Ralph Thomas, Hoboken, New Jersey.

Claim—The movable cap provided with a shreved screen top and base piece, when applied to lamps.

45. Tympans for Printing Presses; L. T. Wells, Cincinnati, Ohio.

Claim—Attaching the cloth or parchment to the frame of the tympan, by means of the leather strips provided with eyelets, said strips being fitted in grooves or rebates in the frame, and the cloth or parchment attached to the strip of the lace.

46. Harvesters; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio.

Claim—So hinging the bar or beam which carries the cutters and fingers to the beam, as that it may be raised up, folded over, and carried upon the main frame. Also, in combination with the beam, the braces, rigidly connected therewith, but hinged at their opposite ends, so that the beam may rise and fall at pleasure, but be permanently braced in its proper position to give the cutter and finger bars or beams in turn their proper working position.

47. Harvesters; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio.

Claim—In connexion with the inner shoe, an adjustable supporting wheel, when said wheel is in advance of the point of the driver or shoe.

48. Harvesters; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio.

Claim—So combining a reel with a platform and main frame that are hinged together, as that the raising and lowering of either shall not in any wise injuriously affect the rotation and uniform action of the reel or change its position with regard to the cutters.

49. Sheet Metal Chains; James Lancelott, Cranston, Assignor to Sacket, Davis & Co., Providence, R. I.

Claim—The forming of the body of each link into a dome, dish, or cup, so as to admit of the projecting arms of each link being bent at a very acute angle against the sides of the dome or cup of the next succeeding link.

50. Sawing Machine; H. S. Vrooman, City of New York, Assignor to Henry Albro', Covington, Kentucky.

Claim—1st, The traveling or sliding collar on lever, as connected with the knife or saw frame, the pawl arms, in combination with the reciprocating connecting rod, the vibrating lever, the pawls, and the ratchet wheels, whereby an increasing rotary speed of the log or bolt is obtained from the traveling collar passing down to a wider sweep of lever, the power being transmitted from the ratchet shaft to the bolt 2d, The cutters attached to the carriage, operated automatically by, and in combination with, the vertical screws. 3d, The lateral moving knife plate or stock, crank, operated by, and in combination with, the vibrating lever. 4th, The combination of the knife, cutters, and the feed movement of the bolt or log.

51. Boot Trees; Wm. W. Wilmott, Assignor to self and Henry F Gardner, Boston, Massachusetts.

Claim—The arrangement of the two sets of toggles and the application thereto of the screw rod, in such manner that it may be free to move longitudinally during its rotary motion on its axis. Also, combining the regulator or latching mechanism (or their equivalent), with the back and front parts of the leg portion of the boot tree, and the separating mechanism applied thereto.

MAY 11.

52. Self-regulating Grain Measure; George W. Atkins, Milton, Delaware.

Claim—1st, The arrangement of the platform, in combination with a box or case, so that the said platform shall have an up and down motion by turning as a lever upon the hinge, or its equivalent, and being supported by means of the double-cross lever and spring, in such a manner as to yield downwardly under the weight of the measure of grain when it is placed thereon, and spring upwardly on moving the same. 2d, In combination with the said ratchet wheels, pawls, lever, indexes, and platform, the two bells, or their equivalents, for the purpose of indicating audibly both the single and hundreds of measures of grain registered by the index.

53. Water Wheel; Jesse Bartoo, East Aurora, New York.

Claim—The iron segment, in combination with the adjustable band and semi-cylindrical cap.

54. Churn; Wm. Brown, Duncannon, Pennsylvania.

Claim—The combination in a churn dasher of a series of slatted agitating and separating wings, a series of gathering and retaining flanches, and a solid concaved roll forming hub.

55. Dressing and Sizing Warps; Wm. Bradley, Manchester, Virginia.

Claim—The combination of the section sleys or reeds, together with the warp sleys or reeds, and the harness for taking the lease or cross shed before the warp is sized in every alternate thread or threads, so as to allow the lease rods to pass with the warp to the yarn beam, and thus dispense with the use of combs, rowels, or guides, after the warp has passed through the size.

56. Harvesters; C. B. Brown, Alton, Illinois.

Claim—Placing the endless apron in an oblique position with the sickle. Also, the endless apron, in combination with the guide rods and sickle, when the several parts are placed relatively with each other.

57. Method of Seating the Movable Cutter in Expansive Bits; Wm. A. Clark, Bethany, Connecticut.

Claim—The combination of the V shaped projection or seat, or its equivalent, with the corresponding groove in the movable cutter above the cutting edge, by which I am enabled to vary the distance of the edge of the cutter near the stock above that of the central cutter to any desirable extent.

58. Corn Planters; Robert J. Clay, St. Louis, Missouri.

Claim—The arrangement of the hopper valve, wheels, shaft, standard, and scraper, when the whole are constructed and operated conjointly.

59. Fasteners for Sleeve Buttons; Henry Cogswell, Providence, Rhode Island.

Claim—Constructing sleeve buttons by attaching the bar to the projections at the inner side of the plate, one end of the bar being pivoted in one projection, and the other projection containing a catch and spring to retain the opposite end of the bar when closed.

60. Harrows; Jonas C. Conkey, Washington, Ohio.

Claim—The combination of the hinge, axle, and axle-tree, when arranged in connexion with revolving harrows.

61. Grain Cleaning Machines; John DeRush, St. Mary's, Ohio.

Claim—The scouring plates, fan, and suction spouts, when combined and arranged relatively with each other.

62. Hub Machine; Lovett Eames, Kalamazoo, Michigan.

Claim—Operating or giving the seed movement to the carriage in which the mortising tool is fitted or placed, by means of the horizontal rotating disk, provided with the ledges, and having its shaft stepped in the treadle, in connexion with the rollers on the shaft, which is rotated from the driving shaft.

63. Reclining Chair; Augustus Eliaers, Boston, Massachusetts.

Claim—1st, The general arrangement of the chair, whereby the back foot-rest, &c., are sustained and actuated, and the foot-rest made adjustable and locked in any desired position. Also, the combination of the hinged rails, sliding arms, and mortises to receive the rails, or in lieu of the rails entering the mortises, in the said combination, the arm attached to the back and turning upon a pivot in the grooved or mortising sliding arm, whereby I am enabled to obtain a very long arm.

64. Pipes for Smoking Tobacco; James W. Evans, City of New York.

Claim—The combination of the bulb or chamber and the sponge, or any other suitable material saturated with water, in the construction of smoking pipes or cigar holders.

65. Water Wheels; J. H. Fairchild, Jericho, Vermont.

Claim—The tube, in combination with the wheel formed of the screws placed on a shaft, and working within the tubular projections. Also, in combination with the wheel and draft tube, the gates.

66. Time-keepers; Henry C. Fay, Troy, New York.

Claim—The invention of a verge with movable detents, so constructed that in the vibrations of the pendulum or balance, each detent will be carried on, nearly on, or past its dead centre so as to greatly lessen the recoil of the movement.

67. Bee-Hives; Edward P. French, Nashua, New Hampshire.

Claim—Making the lower part or both sides of the main chamber inclined toward the orifice of entrance, in combination with the arrangement of an exercising and entrance chamber, feeding-box, warm air spaces, and air ventilating passage leading from the exercising chamber upward against the front sides of the secondary chambers, and over their tops into the chamber, the main chamber communicating with said passage only by means of orifices at its bottom, whereby the main and secondary chambers are kept warm, and at the same time relieved of bad air or carbonic acid gas by a ventilating current of air induced by their heat.

68. Preserve Cans; Edwin W. Gilmore, North Easton, Massachusetts.

Claim—The arrangement of the arm, and the cam, and the bar, whereby the cam is not only made to operate to aid in strengthening the bar when supported, but the arm is enabled to operate as a stop to maintain the can in place while forcing down the cover.

69. Printing Presses; George P. Gordon and F. O. Degener, City of New York.

Claim—Communicating motion to the cylinder at the time of giving the impression by and through the motion of the bed, while the revolution of the cylinder shall be perfected by or through ordinary gearing, or other means entirely independent of the motion of the bed, thus alternating from one of these means to the other, to give a full revolution to the cylinder.

70. Paint Compounds; Wm. G. Huyett, Williamsburgh, Pennsylvania.

Claim—A paint compound composed of ground calcined iron ore, lime, and carbon.

71. Sofa Bedstead; John Irwin, Philadelphia, Pennsylvania.

Claim—The hinge, in combination with the back and seat of sofa bedsteads.

72. Cultivators; L. W. Kelley, Brunswick, Ohio.

Claim—The combination and arrangement of teeth beams with their attaching and adjusting bars, and the scrapers with their attaching and adjusting bars, with each other and with the central beam.

73. Corn Mills; Charles Leavitt, Cleveland, Ohio.

Claim—The manner of securing the revolving grinder to the spindle, by means ef the collar, wings, cap, and nut; also, the recess in the outer casing, in combination therewith the adjusting and securing the grinder in place, by means of the outer casing and the diaphragm upon which the grinder is superimposed. Also, dividing the surfaces of the two grinders into an unequal number of parts or sections, for the purpose of bringing the several sections of the grinders successively into operation; and also, the diaphragm, when arranged in relation to the support of the spindle and grinder, and the collecting and discharging of the meal at one point.

74. Cans for Preserving Food; A. S. Lyman, City of New York.

Claim—The combination of the reservoir or filter of suitable material, with a can having an arrangement for discharging its contents in such manner that whenever any food is drawn off, air or gas deprived of the primary cause of decomposition shall supply its place.

75. Wrench; James McKenzie, Green Island, New York.

Claim—Fixing the movable jaw of an adjustable wrench by a toothed wedge passing through the said jaw fitting into the teeth or notches on the shank, so as to keep the movable jaw firm to resist all pressure that may be applied to it.

76. Reaping and Mowing Machines; L. J., Wm. S., and C. H. McCormick, Chicago, Illinois.

Claim—Making the finger bar of a mowing machine of a bar of iron, wedge-formed in its cross section, with its forward edge which carries the fingers made thin, that the sickles may act upon and cut leaning grass, and with its rear edge thick to obtain the required strength, and the under surface inclined that it may act like a runner to pass and ride over the surface of the ground, to keep the cutting edge of the sickle clear of obstructions, whilst at the same time it can have access to leaning grass.

77. Compound Photographs; T. Miltenberger, Bellefontaine, Ohio.

Claim—The production of a compound photograph, or the taking of separate distinct photographic im-

pressions on each side of a glass plate or transparent tablet, and producing thereby a compound relievo or double stereoscopic effect on a single or simple plane or flat surface, in combination with a totally black back ground, through which solely is produced a transparent collodion film.

78. Cartridge Case; George W. Morse, Baton Rouge, Louisiana.

Claim—My improved cartridge case as constructed with a tige, an annular shoulder, and an expansible cartridge closer, arranged within the body of the cartridge, and made to slide longitudinally therein.

79. Binding Device for Harvesters; George Notman, Deerfield, Ohio.

Claim—The grain box or receptacle, revolving fork, sliding fork, rod, slide, bar, and sliding bottom, used in connexion with any proper raking or conveying device, whereby the grain as it is cut is bound and discharged in sheaves from the machine.

80. Cotton Gins; Enoch Osgood, Boston, Massachusetts.

Claim—The combination of the oscillating clearer and the concave guard or plate, constructed and arranged with the cylinder and the rack and made to operate therewith.

81. Self-inking Hand Stamps; S. E. Pettee, Mansfield, and E. G. Cobb, Foxborough, Massachusetts.

Claim—The roller, or its equivalent, on the lever, working against the curve, or its equivalent, on the lever, to operate said lever and carry the inking roller on, across, and off of the type parallel, or nearly parallel, with the face of the type, so as to ink them uniformly and evenly to make a fair impression.

82. Implement for Shooting Missiles, &c., on Railroads; S. Scattan, Richmond, Indiana.

Claim—1st, The combination of a tube and gravel feeder with a locomotive. 2d, The arrangement for closing and opening the slide when combined with lever and tobe. 3d, The self-adjusting valve in combination with tube. 4th, The elastic disk combined with tube and plug.

83. Instrument for Sharpening Slate Pencils; Gerad Sickels, Brooklyn, New York.

Claim—The instrument consisting of a piece of steel, with an arched concave surface on which teeth are cut, and with eyes at its ends to attach it to the slate frame "or other foundation."

84. Cider Mills; Michael Stevens, Lucas, Ohio.

Claim—The arrangement of the several parts, for the purpose "of retaining the liquor."

85. Harvesters; Oren Stoddard, Busti, New York.

Claim—The supplementary sickle, connected with the sickle proper, and placed relatively with the sickle.

86. Harness Tug Buckle; W. Straw and R. H. Armstrong, Hudson, Michigan.

Claim—The plate provided with one or more tongues attached to the frame at one end, by means of a sliding joint, and attached at the opposite end to the frame, by means of a catch and dovetail connexion formed by the groove in the cross-piece of the frame, and the beveled front end of plate.

87. Corn Huskers; Daniel C. Smith, Tecumseh, Michigan.

Claim—The combination of the forceps with the wedge, roller, lever, post with its slot, the knife and plate. Also, in combination with the forceps, the spring, fork, and thumb-screw.

88. Straw Cutters; Solomon P. Smith, Crescent, New York.

Claim—The arrangement of the arm knife and recoil spring with straw box.

89. Harvesters; Henry C. Smith, Cleveland, Ohio.

Claim—The application of the intermediate wheel at the end of the finger bar, when used in combination with the curved lever and flexible rod. Also, the stops, connected to the frame and placed in such position to the line of draft as will tend to counteract the dragging of the guards or finger bar upon the ground, when hinged to the axle of the driving wheel by the arms. Also, the steps, in combination with the spurs attached to the arms, for the purpose of raising the cutter bar in connexion with the described system of leverage. Also, the rabbet or groove formed in the heel of the cutter bar.

90. Brush; J. H. Tatum, City of New York.'

Claim—The brush constructed so as to form a new and useful article of manufacture, viz: having the bristles secured in detached positions in a metal plate, which forms the back of the brush.

91. Harvesters; John S. Troxel, Mt. Pleasant, Pennsylvania.

Claim—Hanging and operating reels for harvesters on the main shaft, by means of yoke lever and slotted lever, rod, and movable arms, slotted blades, pulley, strap, and slotted plate with screw bolt.

92. Lasts; Sidney S. Turner, Westbro', Massachusetts.

Claim—A last made of wood, and provided with metallic edge guards, and with grooves arranged along and against the inner sides of such guards, and for the purpose of receiving strips of wood, or other suitable material, for the points of the pegs to enter while the last is in use, or a shoe thereon is being pegged.

93. Repeating Ordnance; Grey Utley, Louisburgh, North Carolina.

Claim—The shaft with cams, in combination with the reciprocating hammer, the laterally moving toothed wheel, and the detent, said parts being connected and operating with a many-chambered breech piece having a rectilinear movement.

94. Washing Machine; Miner Van Auken, Chazy, New York.

Claim—The adjustable stop board, arranged at the rear end of the rubber, in combination with the scroll terminating slots in the pendulous arms of the rubber.

95. Ironing Table; Wm. Vandenburg, City of New York.

Claim—The ironing table composed of a board attached to one end of a stand in such manner as to be capable of moving horizontally thereon to and from the other end of the stand, that it may be supported at both its ends during the ironing operation, but permitted to have a garment passed over one end before and after the ironing operation.

96. Burners for Vapor Lamps; Thomas Varney, San Francisco, California.

Claim—The arrangement of the tubes and the passage between them, the burner tip, the wick, and the pipes.

97. Working Ships' Lower Sails in Courses; Samuel Very, Jr., Salem, Massachusetts.

Claim—Constructing what are commonly known as the "courses" of a vessel, viz: the foresail, mainsail, and cross-jack, with a central clew for a sheet or tack in addition to the usual sheet and tack of such sail, for the purpose of enabling a lighter crew to handle those sails.

98. WATER WHEELS; A Warren and E. Damon, Wareham, Massachusetts.

Claim—The supplementary or auxiliary buckets attached to the underside of the lower rim of the wheel, and arranged relatively with the edge of the rim and plate. Further, in combination with the auxiliary buckets, the annular shaped plate, and attached to the scroll in connexion with the ledge on the upper surface of the disk of the wheel.

99. FLY NETS; Robert Wilson, Milton, Pennsylvania.

Claim—The peculiar construction of the fly net, having the stitch set parallel with the rib, combined with the two right angles, formed by the lashes passing through the rib, whether ribs are made flat, round, or any other shape.

100. METALLIC ROLLING SHUTTERS; Wm. E. Worthen, City of New York.

Claim—1st, A revolving shutter, composed of slats of double thickness of sheet metal, so formed at their edges that each slat shall interlock with its neighbor, by being bent at the edge into a configuration. 2d, The combination of a series of such slats having such interlocking edges, with a chain on the side thereof, said chain being constructed and combined with the slats.

101. RAILROAD CAR BRAKES; George W. Zeigler, Tiffin, Ohio.

Claim—The application of pressure to the rubbers by a longitudinal rotary rod under the truck, combined with cams. Also, in combination with the rods and cams of the several cars, the universal joint coupling, to connect the aforesaid rods throughout the train. Further, transmitting the power to rotate the rods through a spring indicating apparatus.

102. SASH FASTENER; F. W. Brocksieper and J. B. Sargent, Assignors to Jos B. Sargent, New Britain, Conn.

Claim—The bolt as an attachment to a sash fastener.

103. STEERING APPARATUS; S. B. Cram and C. Weed, Assignors to S. B. Cram, Boston, Massachusetts.

Claim—1st, The screw and nut, in combination with the ropes. 2d, In combination with the above, the thin tightening apparatus, or any equivalent thereof 3d, In combination with the ropes or chains as applied to "mechanical steerers," we claim the employment of springs.

104. CANDY MACHINES; George K. Tarrington and S. B. Brown, Jr., Assignors to selves and David B. Tiffany, Xenia, Ohio.

Claim—The construction of the machine, the construction of the sugar kettle and spouts, the method of cutting off all the drops with one stroke of the knife, working vertically in connexion with the adjustable pitman.

105. FORKS FOR ELEVATING HAY; C. E. and J. A Gladding, Assignors to C. E. Gladding, Troy, Pennsylvania.

Claim—The head, joint, strap, plate, loop, and cord or wire, whereby all projecting arms are dispensed with, so that the instrument when not required for hoisting purposes may be used as a common fork.

106. UTILIZING WASTE VULCANIZED RUBBER; H. L. Hall, Beverly, Massachusetts, Assignor to "The Beverly Rubber Company."

Claim—Restoring of waste vulcanized rubber by grinding it and mixing it with asphalt, coal tar, resin, pitch. shellac, or other similar substances. so that it can be used again in the manufacture of vulcanized rubber fabrics, and be as serviceable, or nearly so, as where the fabrics are made with the use of the native rubber.

107. FINGER OR GUARD FOR HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio.

Claim—1st, Forming the shoulder on a wrought iron guard, by welding on a piece instead of drawing down a large bar. 2d, The shaping, beveling, and trueing of the guard or finger so as to make them of uniform shape and size by means of a block.

108. WASHING MACHINE; D. E. Rohr, Assignor to self and T. W. Davis, Charlestown, Massachusetts.

Claim—The construction of the fluted rotary device, the sliding reciprocating scoop, with fluted or grooved squeezer or washing board, with yoke beam and pendant devices.

109. GUIDES FOR SEWING MACHINES; L. W. Serrell, Brooklyn, Assignor to John Harold, Hempstead, N. Y.

Claim—1st, The detached tongue around which the edge of the cloth to be hemmed is folded or wrapped to a greater or less extent. 2d, The adjustable hem spreader, in combination with the tongue. 3d, The combination of the separate or detached tongue with the inclined tucker, to pass the edge of the cloth beneath the said tongue, between that and the material on the bed to form the hem. 4th, The finger, in combination with the tongue. 5th, The gauge, in combination with the hem spreader and gauge.

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110. FASTENING FOR HAME TUGS; Joseph E. Ball, Newark, New Jersey.

Claim—The combination of the loop, the dovetailed slide or key, the projections and plate.

111. OPENING AND CLOSING FARM GATES; Wm. F. C. Beattie, Cornwall, New York.

Claim—The combination of the handles with the latch.

112. FASTENING RAILROAD RAILS; Sidney A. Beers, Kings County, New York.

Claim—The use of a bolt or bolts, with nut, key, or clinch, (in combination with, or as an improvement on, the rail patented to me by Letters Patent dated October 27th, 1857,) the bolt passing directly through both rails horizontally, and also the form of the mortises, separate or combined.

113. MACHINERY FOR HULLING AND THRESHING CLOVER; John C. Birdsell, Rush, New York.

Claim—The arrangement of the slatted belt with the bolt, table, threshing cylinder, hulling cylinder, and fan—it being understood that I claim the above only as applied to the construction of clover hulling machines.

114. MAKING SHOT; Alfred Booth, City of New York.

Claim—The filling a chamber with spray and dropping molted lead through it, to facilitate the cooling of the shot.

115. REAPING AND MOWING MACHINES; J. W. Brokaw, Assignor to Warder, Brokaw & Child, Springfield, O.

Claim—The construction and combination of the shell standards and sliding boxes, when used in connexion with a change of pinions, and operating in relation thereto.

116. ESCAPEMENT OF TIME-KEEPERS; Samuel Carpenter, Flushing, New York.

Claim—1st, So constructing a scape-wheel with two rims or rows of vertical teeth, or their equivalent,

as to admit the potance or lower bearing of the staff which carries the pallets and balance to be placed between said rims or rows of teeth, for the purpose of giving double action to the pallets, by which means the watch is prevented from setting by a sudden jerk, as a tooth of one or other of the rims will be acting on its corresponding pallet. 2d, The pallets, in combination with the wheel and detent spring.

117. CORN HUSKERS; Joseph Cawthra, Rochester, New York.

Claim—The inclined reciprocating husker, in combination with the stationary teeth, the inclined curved grate, and the slide.

118. RAILROAD CARS FOR DAY AND NIGHT SERVICE; J. B. Creighton, Tiffin, Ohio.

Claim—1st, The formation of car beds by means of the stationary seats and reversible backs as now in use, in combination with the slotted supporters, stops, pins, stretchers, eccentrics, and reversible hooks. 2d, The method of forming and concealing when not in use in the spaces between the windows, an upper tier of beds; and also, the same, in combination with the devices constituting the subject of the 1st claim.

119. ELECTRIC LAMP; Henry M. Collier, Binghamton, New York, and Henry N. Baker, City of New York.

Claim—The employment in an electric lamp of an open seat, contained in a stationary bridge plate, or its equivalent, and receiving the electrode in such a manner as to allow the point only thereof to protrude through it the distance required, and permitting the advance of the said point so fast only as it is oxidized and reduced by the elertric current. Also, the combination of the loaded tube carrying the upper electrode, the open seat, and the mercury tube, in which floats and is secured the lower electrode, so that while the upper tube feeds the upper electrode down to the open seat as fast as it is reduced, the lower electrode is also fed up as fast as reduced, and kept in its proper position with reference to the upper electrode.

120. BALLOT-BOXES; Allan Cummings, City of New York.

Claim—The peculiar formed cover or top, combining the glass plate, transparent tube, and the wire screens constituting the sides.

121. HORSE POWERS; Jeremiah Darling, Cincinnati, Ohio.

Claim—The independent and endless series of friction rollers, in combination with the double flanched track and the peculiarly constructed endless apron, for the purpose of preventing friction, and for increasing the efficiency of the horse power.

122. MEAT CHOPPER; L. A. Dole, Salem, Ohio.

Claim—The arrangement of the horizontally slotted reciprocating vertical knife shaft, grooved ways, horizontal crank shaft, and central guide tube, for use in combination with the gearing into the same, loose and fast pinions, arranged on the stationary axis of the large driving pinion, and two small pinions which are arranged on a shaft passing through the face of said driving pinion, and have an independent motion of the pinion, while they and it move round a common stationary axis, and are actuated by the same crank or belt.

123. CARD PLATES FOR TRUNKS; Joseph Dudley, Fall River, Massachusetts.

Claim—The frame provided with transverse bars and an elastic plate, the frame being secured to the trunk.

124. CULTIVATORS; John Endsley and Elihu Fletcher, Abington, Indiana.

Claim—The arrangement of shanks and shovels with saddles and beam.

125. BARREL-HEAD MACHINE; Benjamin Fitch, Mooers, New York.

Claim—1st, The combination of the frame and the plane stocks, operated by the movement of the handle. 2d, The combination of the friction band with the swinging platform, operated at one and the same time through the handle. 3d, Releasing the spring catch from the arm, to allow the frame to return to its first position after the saw has effected its purpose, by the lever acting upon the stop.

126. PENCIL SHARPENERS; Walter K. Foster, Bangor, Maine.

Claim—Making the pencil sharpener with a space (or its equivalent), so arranged beyond the inner end of the blade, as to cause the pencil lead to be turned or reduced cylindrically while passing beyond the inner or upper end of the knife. Also, the arrangement of the space with reference to the handle, that is, so as to be separated therefrom or not open into the space or opening thereof. Also, making the body of the pencil sharpener with a light port or opening, arranged opposite to the chip throat. Also, arranging the auxiliary chamber, or its side, with respect to the conical chamber, so that while the lead is being cut by the knife, the lead may not touch the side of the auxiliary chamber, or be so near it as to be ground or injured by particles of lead which may adhere to the sides of the auxiliary chamber.

127. WOVEN TUCKED FABRICS; Thomas France, City of New York.

Claim—The tucked fabric produced entirely by weaving.

128. RAILROAD CAR COUPLINGS; Francis E Gleason, Columbus, Ohio.

Claim—The arrangement and construction of the catch with relation to the bar, and this in combination with the foot-piece, bars or rods, spring, and link.

129. COOKING STOVES; Rensselaer D. Granger, Philadelphia, Pennsylvania.

Claim—1st, Combining an oven constructed of burnt fire clay, or other equivalent material, capable of absorbing and retaining heat with an ordinary cooking stove, in such a manner that the products of combustion may pass either around or through the interior of the oven. 2d, The arrangement of the annular perforated tube and its air pipe with the lining.

130. CORN SHELLERS; Ray Green, Cussawago, Pennsylvania.

Claim—The shelling cylinder revolving within the feeding cylinder, in combination with the feed regulating slide, concave, and springs, fingers, discharging apron, and spout.

131. THICK WOVEN FABRICS; John Gujer, Philadelphia, Pennsylvania.

Claim—The manufacture of stout textile fabrics of considerable thickness, in which all the warp threads are interwoven with the filling threads.

132. FORMING THE HEADS OF CARRIAGE SPRINGS; Samuel H. Hartman, Pittsburgh, Pennsylvania.

Claim—Forming the head or socket on the head plate of a spring, by subjecting them to the action of the dies and counter-dies in the die blocks, and the levers, in the order of their sequence.

133. PLOUGHS; John M. Hall, Warrenton, Georgia.

Claim—The construction, arrangement, and combination of the body of the implement and its movable parts, whereby it is readily adapted to properly receive in turn the several parts employed for performing the various modes of cultivation.

134. Machines for Cleaning Cotton; Thomas Oliver, Yazoo City, Mississippi.

Claim—The arrangement of the toothed rollers, the guides, and toothed carrying apron.

135. Harvesters; Martin Hallenbeck, Albany, New York.

Claim—The tail bar, hinged to the bar, and having the supporting wheel at its rear end, in combination with the lever for adjusting the inclination of the cutters.

136. Harvesters; Martin Hallenbeck, Albany, New York.

Claim—The cutters fitted to move above the level of the heel bar, in combination with the separate guide caps and coupling bars.

137. Signs; James Harrison, Albany, New York.

Claim—The construction of block letters, figures, and other devices, with an interstitial surface of carved ornamental work, with which a colored or illuminated back ground may be employed for rendering signs clearly perceptible at a great distance when viewed obliquely.

138. Stoves; Joseph C. Henderson, Albany, New York.

Claim—The chamber contracted at the top so as to produce and maintain while in action a plenum within the combustion chamber, when used in combination with the exterior chamber and connected by partitions, for the purpose of preventing the escape of the volatile combustible from the combustion chamber, before its combustion is consummated.

139. Reaping and Mowing Machines; Charles Howell, Cleveland, Ohio.

Claim—Connecting the outer end of the finger bar with the gear block, by means of a curved bar, whether it forms a prolongation of the gear block or otherwise.

140. Presses for Zincographic Printing; G. H. Korff, Hoboken, New Jersey.

Claim—1st, The cylinder, in combination with the inking rollers and moistening rollers, the rollers having their bearings connected with rods and used in connexion with the adjustable rings, so that either of the rollers may be moved out from the cylinder, or all moved simultaneously as may be desired. 2d, In combination with the cylinder and rollers, the pressure rollers in connexion with the bars and shaft provided with projections, for the purpose of producing the "bite," or subjecting the paper to the proper pressure between the cylinder and roller. 3d, The feed rollers fitted in elastic bearings and arranged relatively with each other, the pressure roller, feed board, and cylinder, whereby with the aid of the curved rods on the cylinder, the blank sheets are fed between the cylinder and roller. 4th, The peculiar construction of the cylinder and rollers, having plaster of Paris moulded around tubes, so as to obtain the necessary strength and inflexibility with a requisite degree of lightness.

141. Machines for Grinding and Sizing Paper Pulp; Joseph Jordan, Jr., East Hartford, and Thomas Eustice, Hartford, Connecticut.

Claim—The manufacture and sizing of pulp, that is, as constructed of a single conical grinder and outer shell, and with pipes for the introduction of the rags, and the size, and the eduction of both, arranged with reference to the axis and ends of the grinder, and so as to enable the grinder to operate to reduce the rags to pulp and mix the sizing therewith.

142. Hame Tug Fastener; E. D. Lockwood, Churchville, New York.

Claim—Connecting the hame tug to the tongue by means of a joint, so that any strain upon the tug will tend to turn and lock the stud or pin, thus rendering the contrivance self-fastening.

143. Horse Powers; B. F. Love and J. H. Frazee, Shellyville, Indiana.

Claim—The friction wheel and fly-wheel, in combination with spring, lever, and levers on the ends of shafts.

144. Safety Drop for Keys; R. K. Lee, Brooklyn, New York.

Claim—The revolving disk on the rear side of the notched drop. Also, the employment of the notched drop, the eccentric, and disk.

145. Block for Repairing T-rails; S. Mason and E. M. Davis, Michigan City, Indiana.

Claim—The method by which we combine the clamps with the bed-piece or main blocks, by means of the studs or trunnions and the concentric bearings.

146. Toothed Cylinder for Grinding; B. Mackerley, New Petersburgh, Ohio.

Claim—Producing a new manufacture in the shape of an improved toothed cylinder, by combining a properly perforated tube with a series of teeth and the journal pieces.

147. Vapor Lamps; H. N. Macomber, Lynn, Massachusetts.

Claim—Making the ascending and descending air passage of the lamp of a series of chambers, each connected with the other, the whole opening out of and into the reservoir of the lamp.

148. Spring Rocking Cradle; J. B. Malbert and A. Cheviron, St. Louis, Missouri.

Claim—The arrangement of this double escapement with the escape wheel, the wheel being operated by the combination of wheels and springs.

149. Machines for Applying Cop Tubes to Spindles; John Marland, Lawrence, Massachusetts.

Claim—The machine for putting cop tubes upon spindles.

150. File Machines; F. M. Mattice, Buffalo, New York.

Claim—The cut-off valve, lever, cam, plunger, chest, and cams, when arranged and operating in conjunction, for the purpose of opening and closing the passage while filling the chest and discharging the contents of the same by the openings.

151. Machine for Worming, Parceling, and Serving the Rigging of Vessels; P. McLaughlin, Camden, Me.

Claim—The arrangement of devices for worming, parceling, and serving rope, in combination with suitable devices for holding and straining the same.

152. Mill for Treating Chinese Sugar Cane; Henry Meyer, Bridgeton, New Jersey.

Claim—1st, The arrangement of the rollers, the strips, and the revolving cutter. 2d, The expanding strippers, in combination with the rollers, the same being arranged in relation to each other.

153. Aerovapor Burners for Lamps; Oscar F. Morrill, Boston, Massachusetts.

Claim—The arrangement and application of the bent tube with the wick holder or vaporizer, provided

with one or more heat conductors, or equivalent devices, the same being to enable the production of vapor to be regulated and conducted into the mixer. Also, the mode of applying the rod of the wick tube slider to the generator, viz: by carrying it through a tube extending through the reservoir of the generator.

154. Chasing Mills; Charles Moore, Trenton, New Jersey.

Claim—Making a chasing mill self-feeding, automatically and continuously, by means of one or more circular troughs, which receive the substances to be ground or acted upon, and deliver them through spouts on to the bed of the mill under the chasing wheel. Also, the scraper, so constructed and operated as to separate that portion of the material on the bed of the mill which is ground most, automatically and continuously, from that which is ground less, and deliver it to the discharge opening in the bed of the mill. And in combination with a continuous, automatic, self-feeding apparatus, or a continuous, automatic, self-delivering apparatus applied to a chasing mill, a heated bed, so as to heat, grind, mull, and mix the materials to supply to the mill automatically or without manual labor, at one and the same time.

155. Manufacture of Metallic Zinc; Alfred Monnier, Camden, New Jersey.

Claim—The process of obtaining metallic zinc from its ores, by means of the combined metallurgic operations.

156. Method of Feeding the Bolt in Lath Machines; James Nevison, Morgan, Ohio.

Claim—The wedge rack riding on an inclined plane, in combination with the arms provided with the spur wheel, ratchet wheel, and ratchet, for the purpose of elevating the log and giving it a throw, and also for holding it in place during the stroke of the knives.

157. Safety Attachment for Railroad Cars; H. A. Newhall, Newton, Massachusetts.

Claim—The supplementary platforms or treads, formed of the rods fitted in tubes attached to the platforms, the rods bearing against springs in the tubes, in combination with the side guards formed of the vertical rods attached to the bars, and the chains which are connected to rods, and the railing or guards of the platforms.

158. Preparation of Fibre for Paper Pulp; Martin Nixon, Philadelphia, Pennsylvania.

Claim—1st, The manner of applying the steam, whereby the solution is automatically and continuously delivered on top of the straw. 2d, The process of boiling whole straw by the combined arrangement of an upward current of steam, and downward current of alkaline solution, permeating the mass and acting upon it in conjunction.

159. Slicing Apples; H. J., and B. Norton, Farmington, Maine.

Claim—The combination of reciprocating frame provided with the knives and pressure bar, with the intermittingly rotating arbor.

160. Burners for Vapor Lamps; John K. O'Neil, Kingston, New York.

Claim—The arrangement of the burner beneath the vaporizing tube or chamber, in such a manner as to be movable or adjustable to different distances therefrom, whereby the amount of light produced and of vapor generated may be exactly and in all degrees regulated simultaneously, and be mutually dependent on each other.

161. Corn Planters; L. B. Phelps, Geneva, Ohio.

Claim—The arrangement of the adjustable furrow openers, handles, lever, and spring catches with runners.

162. Lathe Dog; Nathan M. Phillips, City of New York.

Claim—The lathe dog having its body formed of one piece and having an aperture in which the follower operates.

163. Manufacture of Artificial Whalebone; C. Poppenhusen, City of New York.

Claim—Subjecting it to mechanical pressure after it has been saturated with linseed oil, or equivalent substance, and whilst the oil, or other equivalent saturating substance, is in the viscid state.

164. Apparatus for Cleaning the Coulters of Ploughs; Abner Reeder, Wrightstown, Pennsylvania.

Claim—The spring sliding rod with any convenient number of prongs, when connected and arranged on the plough.

165. Seeding Machines; L. Robinson, Melrose, Massachusetts.

Claim—The reciprocating slide, in combination with the supplementary or auxiliary perforated slides, one or more pairs.

166. Self-lighting and Extinguishing Lanterns; A. Roesler and C. Frey, Warsaw, Illinois.

Claim—1st, The box provided with spring, plates, springs, and arms. 2d, The slide, rods, in combination with arms. 3d, The supporters, plates, catch, rod, in combination with the extinguisher.

167. Street Sweeping Machines; Andrew J. Roberts, Boston, Massachusetts.

Claim—1st, Hanging the brooms or brushes in a swinging frame on centres, so arranged that it can be readily leveled and adjusted as fast as the brooms become worn. 2d, The combination of devices whereby the brooms are raised or lowered, and at the same time the communication between the driving power and brooms established or cut off, the same consisting of the bent lever arm, short arms, and pulleys. 3d, Attaching the spring plates to a swinging movable frame which is raised and lowered with the brooms, whereby the said springs are raised from the ground when the brooms are not in use, and adapt themselves closely to the surface of the ground, and press against the same when the brooms are at work, thereby preventing, by the weight of the brooms acting upon the springs, the vibrating or "bobbing motion," which otherwise the broom would receive. 4th, In combination with the studs in the driving wheels, the circular grooved pulleys.

168. Apparatus for Baking and Cooking; W. G. Ruggles, Worcester, Massachusetts.

Claim—The arrangement of the flue or flues with the slides and openings.

169. Devices for Regulating by Electricity the Issue of Gas from Burners; Charles W. Smith, Evans, New York.

Claim—The combination and use of a permanent and temporary magnet, and of two temporary magnets, one fixed and one vibratory, with a pawl and ratchet situated upon the supply cock of a gas burner or series of burners. Also, the use of a thin slip of metal, or its equivalent, to deflect a portion of the jet of gas upon an ignited platina coil, situated entirely without the jet.

170. Machine for Affixing Post-office Stamps to Letters; George K. Snow, Watertown, Massachusetts.

Claim—The combination of feeding mechanism, shearing or cutting mechanism, a platen and bed applied

together, so as to constitute a machine for affixing postage stamps to letters. Also, the arrangement of the feeding mechanism, the platen, and the shear or shears with respect to the lever and the bed, whereby the reciprocating motions of the lever results will take place. Also, the gauge, in combination with the bed or the table, and the post-stamping mechanism. Also, combining with the post-stamping apparatus, or in one frame with it, a means of damping or wetting the surface or that part of a letter on which a stamp is to be affixed.

171. Boot-jack; O. S. Sikes, Suffield, Connecticut.

Claim—The arrangement of the clamps, spring, and pins.

172. Moulding Frame for the Construction of Boats; Nathan Thompson, Jr., Brooklyn, New York.

Claim—A frame capable of supporting and confining in proper relative position the various parts that make up the frame of a boat; and in combination with such a frame, means for holding the frame in proper necessary positions, and admitting of an easy change from one position to another. Also, in combination with such a frame, lifting screws passing through the gunwale frame.

173. Tips for Fishing Rods; J. C. Underwood and T. J. Bargis, Richmond, Indiana.

Claim—Attaching the pulley to the top of the rod through the medium of the socket, or its equivalent, so arranged that the pulley is prevented from turning entirely around the tip, and the line thereby prevented from winding around the rod, and at the same time the pulley allowed to adjust itself so that the plane of its rotation may at all times be made to coincide with that of the line.

174. Grinding Mills; S. Vascow and A. Guiraud, Cincinnati, Ohio.

Claim—The combined arrangement of the braking rollers with the cylindrical grinder and concave, for adjusting the cylinder and concave apart for grinding.

175. Securing Metallic Bands on Cotton Bales; P. C. Ingersoll, Assignor to self and H. F. Dongherty, Green Point, New York.

Claim—The batten pivoted to the plate provided with openings, the batten being provided with recesses at its ends.

176. Nail Machine; John L. Krauser, Reading, Assignor to self and James Harper, Philadelphia, Penna.

Claim—Forming a groove or grooves in the anvil cutter to receive the flanch or flanches on the nail plates. Also, in combination with a vibrating anvil or anvil cutter, the placing of the cutting edge of said cutter at or near the centre of motion of said vibration. Also, the rims or adjustable sections on the perimeter of the rotating cutter wheel, for regulating the size of the nail to be cut. Also, in combination with a rotating cutter wheel and a vibrating anvil, the inclination given to said anvil and its cutter.

177. Devices Attached to Hand Saws for Squaring and Marking; H. Smith, Camden, New Jersey, Assignor to H. Disston, Philadelphia, Pennsylvania.

Claim—1st, Riveting the shoulder strips directly to the blade and independent of the handle. 2d, The combination of the sharpened projection with the graduated saw blade.

MAY 25.

178. Valve Cock; Seth Adams, Boston, Massachusetts.

Claim—My improved disk valve cock, with one coupling pipe seat, disk valve, and valve chamber, so that when the valve may be raised above the bore of the coupling pipe, and a column of fluid may be passing through the said pipe, such column shall flow through the said pipe and valve chamber in a line with the axis of the pipe, or in a straight line, and enter the valve chamber at one side and pass out of its bottom, or enter at its bottom and pass out of its side, and through an opening of the valve seat, whose sectional area shall be equal to, or greater than, that of the bore of the coupling pipe.

179. Breech Loading Rifle; Charles Wm. Alexander, Moorefield, Virginia.

Claim—The replacable rifled cylinder, with its dove-tail for cap and notch for holding it in its place, in combination with the revolving chamber that bears it and holds it to its place.

180. Furnace Grates; Albert J. Allen and Wm. S. Hudson, Paterson, New Jersey.

Claim—The combination together of the vertically moving furnace bars furnished with projections.

181. Driving-Wheels for Portable Steam Engines and Agricultural Implements, &c.; George W. Barnett, Springfield, Ohio.

Claim—Providing a wheel with one or more series of radial elastic feet.

182. Steam Boilers; George W. Barnett, Springfield, Ohio.

Claim—In combination with a furnace arranged centrally within the boiler, the smoke flues and exhaust pipes, when so arranged that the smoke and waste heat of the furnace, as also the exhaust steam, shall be conducted together downwards through the water in the boiler in the same pipes.

183. Composition for Varnishing Leather; Obadiah S. Boyden and M. C. Frederick, Newark, New Jersey.

Claim—The employment in the compounds used in the manufacture of glazed, japanned, or painted leather, cloth, silk, and paper, either wholly or in part, as a substitute for camphene or spirits of turpentine, of a paste made of the glutinous properties of flax seed.

184. Sounding Apparatus; Richard F. Bridwell, St. Louis, Missouri.

Claim—The use of a lever applied to the bow of a vessel so constructed, combined, or arranged as to vibrate in either direction.

185. Hoisting Ice; Wm. G. Brower, Staatsburgh, New York.

Claim—The receptacle or box connected with the drum or windlass by the chain or rope, the drum or windlass being fitted loosely on the driving shaft, and connected with, and detached from, it at the proper time by means of the clutch actuated through the medium of the sliding bars, spring, and lever catches, so that the several parts will operate automatically by a continuous motion of the driving shaft.

186. Lathes; Jared T. Bunce, East Haddam, Connecticut.

Claim—Constructing the slide rest of two parts, so that the one part may have a movement independent of the other, in combination with the nut formed of two parts, and used in connexion with the worm wheel, which is actuated simultaneously with the parts of the nut.

187. Vapor Lamp Burners; Daniel H. Carpenter, City of New York.

Claim—Regulating the quantity of air to be mixed with hydro-carbon vapor, consisting of the screw stop

placed in the tube at such distance below the exit aperture as shall leave the requisite space for the mixing of the gases before reaching said aperture. Also, the construction of the valve for the vapor passage, whereby the said passage is kept free at all times without increasing the size thereof.

188. Harrows; Vasco M. Chaffee, Grayville, Illinois.

Claim—The combination of the side pieces, a cross-bar, or their equivalents, with the rotating harrowing wheels.

189. Device for Actuating the Index of Hygrometers; Charles L. Clark, Rochester, New York.

Claim—The combination of the slotted weight with the shaft, whereby the shaft is actuated by the horizontal rotation of weight, without obstructing the vertical movement of the latter.

190. Hominy Mills; James M. Clark, Lancaster, Pennsylvania.

Claim—1st, The arrangement of the apertures and, in the conveyer case, with the slide valve. 2d, The combination of a movable or stationary conveyer with, and formed on, the shaft of the bolting reel, for the purpose of conveying the material into the bolt to any required distance to effect the object.

191. Reciprocating Paddle; Peter C. Clark, Reading, Pennsylvania.

Claim—The arrangement of the lever, having an adjustable paddle, with the radius bar and crank arm, in their relation to each other and to the crank shaft.

192. Flouring Mills; Edwin Clark, Lancaster, Pennsylvania; ante-dated February 2, 1858.

Claim—The valve or series of valves, with their perforations, in combination with the apertures in the bolting chamber, so as to make said valves common to the three different transits of the ground material. Also, in combination with the circular division, the inclined planes for properly conducting that portion of the material that falls upon the space between them into its proper channel.

193. Machine for Guiding Saws; Wm. Clemson, East Woburn, Massachusetts.

Claim—The employment of a revolving friction clamp applied to the saw to receive rotary motion from the saw, and to control the revolution of the saw by the momentum it acquires by such rotary motion.

194. Lubricating Car Axles; John W. Cochran, City of New York.

Claim—The arrangement of the rollers upon the coil, said coil having within it a shaft or rod of metal or wood, with the rods attached to studs in their relation to each other and to the box and axle.

195. Valve Propeller; Aaron Colton, Le Roy, New York.

Claim—The connexion of the paddles with the sliding frames and the flat plates, in combination with the stops.

196. Burglars' Alarm Locks; Addison Corey, Casstown, Ohio.

Claim—The application to door locks of the insulated knob, these extra bolts, levers, and springs, in this arrangement with any lock, and these several galvanic attachments in combination with the lock, which will produce the intended effect.

197. Harvesters; J. H Conklin, Rockford, Illinois.

Claim—1st, The vibrating divider, in combination with the cutting apparatus, whereby the grain is gathered into the cutters in order that the parts of the machine following after may perfectly clear the standing grain. 2d, The curved or turned up and slotted ends of the finger bar, in combination with a vibrating lever.

198. Water Wheels; John Custer, Finley, Ohio.

Claim—Placing the plate loosely on the shaft, and rendering the same adjustable thereon, by means of set screws, or their equivalents, in connexion with the adjustable mouth in the sluice. Also, the buckets, so that the percussion force of the water is obtained, and also the force produced by its weight as it passes from the buckets, and the water at the same time allowed to pass in a very direct and uninterrupted manner through the buckets, so as not to occasion much loss of power by friction.

199. Wind Wheels; Wm. H. Derrick, Stockton, California.

Claim—The movable or traversing vane, with weight attached, in combination with the permanent or stationary vane.

200. Leveling Device Attached to Hand Saws; H. Disston and T. L. Morss, Philadelphia, Pennsylvania.

Claim—Placing the two spirit tubes or levels in the handle of the saw relatively with each other and the back edge of the saw.

201. Window Spring; Edward Doen, New Britain, Connecticut.

Claim—The combination of the independent obtuse angled lever and direct-acting spring bolt, arranged for action together relatively to each other and the face plates of the casting which carries both, and for connexion with the window casing as a fastener to the sash.

202. Railroad Car Brakes; C. H. Eisenbrandt, Baltimore, Maryland.

Claim—The manner or mode of direct application to the axles of wheels, of the lever and screw, with the clasping boxes, griping collars, and the pivot and socket axles, the pendant bearings, with the box seats, —the connecting yoke eye rods, the car guides, the whole arranged, combined, and operated with the other devices.

203. Knife Polisher; H. T. Field, New Braintree, Massachusetts.

Claim—The combination of the annular buffers with the disks, when arranged on the adjacent faces of both disks.

204. Carpet Fastener; W. Filkins, Lancaster, New York.

Claim—The arrangement of the horizontal swinging slotted cap with the plate and the spur.

205. Gang Ploughs; J. Frye, Mendota, Illinois; ante-dated March 18, 1858.

Claim—The attachment of the tongue to the forward and rearward plough stocks, and the connexions between the various plough stocks, so that when the team is turned the ploughs shall be turned so as to point towards a common centre. Also, the connexion of the forward furrow wheel with the tongue, by means of the curved slotted arm and bolt, in combination with the crank and connecting rods between the wheel shafts, so that when the team is turned, the forward wheels shall be turned in the same direction, and the rear furrow wheel shall be made to track the forward wheels. Also, hanging the hinged coulter to the rear of the front furrow wheel, by means of a chain which, when the team is turned, will raise said coulter out of the furrow.

206. Apparatus for Catching Fish; Jacob Garl, Suffield, Ohio.

Claim—The sliding trigger, the notch, key, nut, as applied to a machine for catching fish.

207. Machine for Turning Irregular Forms; N. J. Glover, Waveland, Indiana.

Claim—Two traversing and vibrating cutters arranged to work on the opposite sides of the piece of wood turned. Also, arranging the nuts or racks of teeth (upon which the screw acts to traverse the cutters,) upon the cutter bars in such a way and manner, that when the cutters are brought into action. the racks will be brought to the screw so as to traverse the cutters, and when the cutters are thrown out of action, the racks which traverse them are released from the screw.

208. Cutter Head and Table Rest for Cutting Irregular Forms; J. P. Grosvenor, Lowell, Massachusetts.

Claim—1st, The rest, in combination with a cutter head. 2d, Securing the cutters to the head by means of grooves in the collars, when the cutters are set in planes forming angles with each other.

209. Cheese Presses; Jacob Hibbard, Weathersfield, New York.

Claim—The combination of the levers, connecting rods, weight, and follower.

210. Manufacture of Dextrine and Sugar; T. A. Hoffman, Beardstown, Illinois.

Claim—The combination of steam and acids for converting starch, corn, or other cereals, into dextrine gum, or sugar, when said grain is subjected to the action of diluted acids, and the temperature of the mass is elevated to 225 or 300 degrees Fahrenheit.

211. Thermostat; S. Holton, Jr., Middlebury, Vermont.

Claim—The slotted plates, carrying the pin, and the notch in which it works applied to the componnd bar and to the lever, to vary the effective length of one arm of said lever, and yet preserve its proper relation to the compound bar.

212. Omnibus Register; R. E. House, Binghampton, New York.

Claim—The combination of a step protected, resting on a yielding support, such as a spring, or its equivalent, with recording mechanism to be operated by the step.

213. Wind-Wheels; James B. Johnson, San Francisco, California.

Claim—Constructing the wind-wheel with stationary and adjustable sails.

214. Apparatus for Separating the Combustible from the Incombustible Gases or Products of Combustion in Furnaces, &c.; W. D. Jones, Hagaman's Mills, New York.

Claim—The box with its inlet, separating diaphragm, chambers, pipe or passage, and two fan blowers.

215. Iron Gate or Fence Post; T. E., A., and E. King, Cherry Valley, Ohio.

Claim—A fence post composed of the parts, provided with toothed or serrated edges, arms, and keys, and in combination therewith the wings and stud. Also, the manner of securing the gate hinges, by means of the lugs and notches, the same being held in place by the keys.

216. Production of Electrotype Plates; Silas P. Knight, City of New York.

Claim—The treatment of the plumbago coated moulds with a solution of the sulphate of copper and the dust of iron, by which a metallic film is produced.

217. Marine Alarm and Fog Signal; L. Lewenberg, City of New York.

Claim—The hollow cylinder or drum open at the ends and fitted with the ribs or plates, when arranged to act on and within the circular ranges of metallic springs attached to the rings.

218. Preparing Paper Pulp from Reeds; Henry Lowe, Baltimore, Maryland.

Claim—The process of making paper pulp from reeds, by first disintegrating the reeds by boiling in a solution of caustic soda accompanied by agitation, and then reducing them directly to pulp without reducing to half stuff by the machine technically called the old rag engine.

219. Protractor; Josiah Lyman, Lenox, Massachusetts.

Claim—1st, The arrangement of the several verniers, limbs scales, and rule in one instrument. 2d, The peculiar arrangement of the sliding vernier scale, by which it can be applied with equal readiness and facility to either side of the rule, so as to read the given angle and its complement.

220. Seeding Machines; Joseph McCammon, Dayton, Ohio.

Claim—The blade attached to the rotating shaft which is placed within the hopper or seed box, in combination with the adjustable slides and concave bottom.

221. Seeding Machines; G. M. L. McMillen, Dayton, Ohio.

Claim—The employment or use of the shaker, placed between the rotating flanches, and operated by the curved rod and cam, the sliding plates, gauge, and cylinders.

222. Foot Cleaner; Allan McKeachnie, City of New York.

Claim—The scraper, in combination with the rotary brushes and elastic rotary brushes, with or without the cleaners, the above parts being placed within a suitable shell or basin.

223. Corn Huskers; B. B. Meacham, Ridleyville, Florida.

Claim—The wheel, grooved circumferentially and provided with the knife or cutter, forked plate, and oblique partition or ledge, and arranged relatively with the spouts.

224. Straw Cutters; Oren Moses, Malone, New York.

Claim—The arrangement of the bridle pieces or connecting plates attached to cleaning comb, with driving shaft and journals of feeding rollers, the whole being constructed for operation conjointly with feed box, rest, shaft, disks, and knives.

225. Bed Bottom; James M. Noble, Delhi, Iowa.

Claim—The pulleys attached to two opposite sides or ends of the bedstead by cords, straps, or equivalent means, so as to admit of the free turning of the pulleys and the twisting of the same in planes at right angles with their plane of rotation, in combination with the rope which is strained around the pulleys. Also, in combination with the pulleys and rope, the elastic bands.

226. Journal Boxes; James A. Norris, Philadelphia, Pennsylvania.

Claim—1st, The combination of the glands, &c., with a box having stuffing boxes formed in each end. 2d, Arranging a packing between the adjacent sides of the box, whereby the entrance of any dust between said sides is rendered impossible.

227. CLOTHES PIN; D. Pierce, Sunapee, New Hampshire.

Claim—A new article of manufacture, to wit: a clothes-pin.

228. WASHING MACHINE; F. B Pratt and F. Tylee, Cleveland, Ohio.

Claim—The fluted brake when attached to yielding bearings, parallel with fluted roller, in combination with the united open flapped and endless aprons.

229. SEEDING MACHINES; A. M. Pratt, Lowell, New York.

Claim—Attaching the furrow and covering shares respectively to shafts, which are allowed to turn in their bearings, and are used in connexion with the shaft attached to the lever, crank, and lever, which support one end of the seed distributing shaft.

230. RAILROAD SWITCH; N. Pullman, New Oregon, Iowa.

Claim—1st, The combination of the bent switch rail with the shoe. 2d, The combination of the curved blocks with the shoe and the switch rail, for the purpose of regulating the inclination of the switch rail to the track, and also its angle of divergence from the track.

231. GOVERNOR FOR HORSE POWER; Lea Pusey, Wilmington, Delaware.

Claim—The loaded levers or sliding weights provided with brakes, connected by a spring and rods, and attached to an independent rotating disk or rotating arms, or to the fly-wheel of the machine to which the device is applied, in combination with a stationary or revolving rim.

232. WASHING MACHINE; A. Quimly, Terre Haute, Indiana.

Claim—The combination of the approximating plungers with the revolving tub, whereby the clothes are subjected to a continuous rotary action and at intervals to a squeezing or expressing action, and thereby thoroughly washed.

233. FLOURING MILL; C. Rands, Peoria, Illinois.

Claim—1st, The combined arrangement of the upper and lower stones, reduced from their centre outward to mere rim grinding surfaces comparatively, two annular non-grinding plates, one or both concave, placed over the enlarged eye of the stones, and the horizontally revolving fan or blower, arranged intermediate between the stones, and crossing vertically the space existing between the same, so as to force the grain with a direct action out to the grinding surface, and to give a direct blast. 2d, The fan when constructed with its blades radial, and situated in the specified relation to the space existing between the stones, so as to give a direct blast. 3d, In combination with the above, the arrangement for suspending the stones, consisting of rings, each having four axes, and one being arranged on the spindle of the stones, and the other between the standards of the frame. 4th, The combination of the spirally flanched, revolving, and sliding cylinder, friction wheels, and spindle.

234. APPARATUS FOR DISTILLING SPIRIT OF TURPENTINE; Daniel Reid, Washington, North Carolina.

Claim—The employment in connexion with the still of a steam box constructed with strainers, and of such form and capacity as to receive the barrels of crude turpentine.

235. LIFTING JACKS; A. C. Richard, Newton, Connecticut.

Claim—The standard provided with screws and pinions, in combination with the traverse bar and the adjustable friction rollers.

236. LAMPS FOR BURNING COAL OIL, &c.; George Rimmington, South Brooklyn, New York.

Claim—The cap formed of two parts, perforated and used in connexion with the two tubes, the several parts being arranged relatively with each other and applied to the lamp.

237. LIFE BOAT; A. L. Shears, Omro, Wisconsin.

Claim—The arrangement of the sides as constructed with the hull proper of the boat forming the air chambers, and being open below, and these sides and air chambers combined and arranged with the scuppers and valves.

238. GAS RETORTS; J. T. Sloan, V. Smith, M. Hoover, and R. M. Briggs, Jackson, California.

Claim—The employment in the manufacture of gas from wood, of a cylindrical retort placed horizontally and having a door to close the opening for the reception of material, swinging upon hinges and shutting with staple and eye to receive a wedge, the other end being closed with a clamp and wedge.

239. COMBINED ROCKING CHAIR AND CRADLE; A. S. Smith, Lawrence, Massachusetts.

Claim—The adjustable back and foot-rest, connected by the levers and arranged relatively with the seat, and used in connexion with the rockers connected to the legs by the swivel sockets.

240. SEED DRILLS; J. C. Stevens, Lee, Massachusetts.

Claim—Connecting the bars or beams to the frame of the machine by means of joints to prevent the front and converging ends of the boxes from coming in contact with each other when raised, and using in connexion with the bars or beams thus hinged, a distributing mechanism, so that the distributing device will be thrown out of gear with the wheels simultaneously with the elevating of the bars or beams, and consequently the teeth.

241. RAKING ATTACHMENT TO HARVESTERS; J. A. St. John, Janesville, Wisconsin.

Claim—The particular means employed for operating the rakes, viz: the reciprocating slide, arm, crank, shaft, with the rakes attached, in connexion with the lever, pinion, and segment.

242. WRENCH; George C. Taft, Worcester, Massachusetts.

Claim—Arranging the lowermost screw to work in a screw rack on the shank of the wrench, and providing the said screw with a cylindrical slider extending below it, and operating so as not only to turn around, but move longitudinally with the screw and in a socket piece connected with the handle.

243. FEED REGULATOR FOR STEAM BOILERS; L. Thom, City of New York.

Claim—Making the stem or arm of a hollow float which is applied to the cock with a passage through it, connecting with a passage leading through one end of the plug of the cock, and thereby forming a communication from the interior of the float to the atmosphere.

244. ATTACHMENT FOR OPENING AND CLOSING DOORS, &c.; A. W. Webster, Waterbury, Connecticut.

Claim—The levers pivoted to the lintel of the casing or the sill thereof, the inner ends of the levers gearing into each, and the outer ends connected by the arms to the doors or shutters.

245. Portable Soda Water Apparatus; E. D. Wheeler, Murfreesboro', Tennessee.

Claim—Inclosing the charge in a long fibrous case or bag, when said case or bag is used in combination with a soda water apparatus.

246. Compositions for Artificial Leather; Samuel Whitemarsh, Northampton, Massachusetts.

Claim—The fabric within, composed of cotton, or other fibrous substances, in a woven or unwoven condition, saturated or coated with a compound of linseed oil and burnt umber that has been prepared.

247. Changing Rotary into Reciprocating Motion; S. L. Wiegand, Philadelphia, Pennsylvania.

Claim—1st, The oblique wheel adjustable on an axis transverse to the revolving shaft. 2d, Giving a permanent lead to the motion by a permanent inclination of the wheel, in combination with a variable inclination. 3d, Conveying the vibratory motion to the rods, by means of ball and socket or universal joints, when said joints are used in combination with the frame.

248. Power and Hand Drills; H. Woodman, Biddeford, Maine.

Claim—1st, Constructing an eye or box in the upper end of the post, in combination with the hollow shaft and spindle frame, whereby the spindle carried by the frame may be set and operated at any required distance from an angle to the said post. 2d, The combined arrangement of the hollow shaft, frame, gears, and spindles, and with their projecting ends, whereby the drill spindle may be driven either directly or through the medium of shaft and bevel gears. 3d, The arrangement of the removable platen or face plate with the sliding clamp jaws, collar, and set-screw.

249. Vapor Lamps; Horatio Bateman, Boston, Assignor to Wm. F. Bateman. Harvard, Massachusetts.

Claim—Constructing the spur or tongue with a suitable eye for the insertion and retention of the wick.

250. Machine for Cutting Pipe; Michael Bower, Assignor to self and Geo. B. Waterhouse, Charlotte, N. C.

Claim—In combination with the cutters, the two revolving disks with their series of holes, the holes of one disk being furnished with loose sleeves or rings for the purpose of adapting the machine to the cutting off of pipes of various sizes.

251. Steam Trap Valve; J. W. Hoard, Assignor to self and G. B. Wiggin, Providence, Rhode Island.

Claim—The construction of the valve, with a metal stem, part of which is hollow and communicates with the hollow interior of the valve, and is fitted with a hollow cap, which also serves as a nut to secure the valve against longitudinal expansion, whereby provision is made for filling it with liquid and confining such liquid therein.

252. Stoves; Charles Hooffstatter, Assignor to Joseph Firman, Rome, New York.

Claim—The flues and partitions in connexion with the ovens.

253. Method of Extracting Teeth; Jerome B. Francis, Assignor to Wm. Harper, Jr., Assignor to Jerome B. Francis, Assignor to James J. Clark, Philadelphia, Pennsylvania.

Claim—The combination of the electro-magnetic machine, or its equivalent, with the dental forceps, for removing teeth without pain.

254. Knife Cleaners; Wm. Miller, Waltham, Massachusetts, Assignor to self and Daniel S. French, Wadham's Mills, New York.

Claim—The shelves.

255. Railroad Car Couplings: Allen Lapham and Daniel H. Burns, Brooklyn, New York, Assignors to selves and Charles A. Durgin, City of New York.

Claim—A tilting hook and lever acting in combination, whereby the coupling mechanism is rendered automatic and capable of being disconnected instantaneously, irrespective of the tension or draft of cars.

256. Rotary Last Holder; David Philbrick, Manchester, New Hampshire, Assignor to Elmer Townsend, Boston, Massachusetts.

Claim—My improved support piece of the radial arm, viz: as made of a standard and plate, and a circular plate, formed to enter the recess of the plate and to make with such a dove-tail groove, or its equivalent, for receiving the head of the clamp screw, the two plates being confined together by a screw and nut. Also, the improved last holder, hinge and clamp, viz: with its clamping and hinge pin, constructed with a head to bear against one end of the male part of the hinge, and to turn and be supported in one of the prongs of the fork of the hinge.

257. Harvesters; Wm. H. Seymour and Henry Pease, Assignors to Wm. H. Seymour and Dayton S. Morgan, Brockport, New York.

Claim—The arrangement of the tongue on a pivot in advance of the cutter, and in a guide provided with a detent in rear of the cutter, so that the attendant can conveniently and readily by means of the link raise the cutter by lifting directly the rear end of the tongue.

258. Casting Faucets; Oliver T Wood, Pittsburgh, Assignor to Thomas R. Wood, Philadelphia, Penna.

Claim—Constructing faucets by placing the spigots within a mould formed for the tubes of the faucets, and casting the tubes around the spigots.

259. Railroad Brakes; Joseph Harris, Alleghany City, Pennsylvania.

Claim—1st, The combination of the cross-arms on each of several cars, with a chain shaft on one car connected by chains, rods, or ropes, for the purpose of adjusting and operating the brakes. 2d, The combination of the tumbler with the extension shafts, the purchase rods, and springs, to act automatically as a railroad brake.

Re-Issues.

1. Syrup Castors; Edmund Bigelow, Springfield, Mssachusetts; patented April 6, 1858; re-issued May 4, 1858.

Claim—The combination of a self-measuring faucet and air tube with each of two or more reservoirs for syrups, or like fluids, the reservoir being on a common base forming a castor.

2. Harvesters; Charles Crook, New Hope, Pennsylvania; patented March 5, 1857; re-issued May 4, 1858.

Claim—1st, Operating and changing the speed of the cutters, by means of the internally geared wheel and spur wheel, in combination with the pinion. 2d, Connecting the rod to the end of the lever, by means of the swivel joint, when said joint is situated at or near the centre of vibration of the cutter frame.

3. BAGASSE FURNACES; Abraham Hager, Baton Rouge, and Youngs Allyn, New Orleans, Louisiana; patented May 6, 1856; re-issued May 4, 1858.

Claim—Inserting in the furnace a skeleton dome rising above the exit flue, so as to arrest the fall of the wet bagasse, and for a limited time retain it above the fire, without obstruction to the draft of the furnace.

4. BOXES FOR RECEIVING PASSENGERS' FARE; John B. Slawson, New Orleans, Louisiana; patented July 28, 1857; re-issued May 4, 1858.

Claim—A fare-box having two compartments, into one of which the fare is first deposited and temporarily arrested previous to its being deposited in the other, when the former is provided with glass sides so arranged that the passenger can see through one, and the driver or conductor through another.

5. ARITHMOMETER FOR ADDING; O. L. Castle, Upper Alton, Illinois; patented November 24, 1857; re-issued May 11, 1858.

Claim—1st, The combination of the repeater, the stationary repeater stop, the sliding stop bars, &c., and the stationary stop pin with the driving-wheel, or its equivalent, provided with a series of holes. 2d, Combining the shaft of the driving-wheel, or its equivalent, with the keys, &c., by means of a stronger spring, and a weaker spring, and a lever deriving motion from the keys. 3d, Combining the keys with the sliding stop bars, &c., by means of the wedges attached to the keys, the arms sliding on guide bars, and the collars and springs applied to the guide bars. 4th, The loose teeth applied to the wheels. 5th, Making the "register" movable longitudinally relatively to the driving-wheel, for the purpose of changing the driving operation to the register wheels of different denominations at pleasure.

6. SAWING MILL; Wm. Hawkins and Wm. C. Clary, Milwaukie, Wisconsin; patented March 30, 1858; re-issued May 11, 1858.

Claim—Changing the saw after each cut alternately from an oblique position in one direction to an oblique position in a contrary direction, to the line of the log carriage while cutting in either direction by the movements of the machine. Also, the swing guides, in combination with the stationary guides. Also, the two wedge rollers or wedges, and to keep the board clear of the saw while cutting in either direction. Also, the combination of pinions and their pins entering into recesses of plates, the ratchet wheels, the ratchets, the adjustable segments, the wheels, the screws, and the rods, with their clutches, and for the purpose of setting the dog to the saw, and stopping the setting when the log frame advances too close to the saw. Also, the notched plate, in combination with the latch, lever, and link, for the purpose of operating the belt shifter without turning the lever.

7. SEED PLANTERS; B. Kuhns, Dayton, Ohio, and M. J. Haines, Delaware City, Delaware; patented September 30, 1856; re-issued May 11, 1858

Claim—The pocketed roller running close to the bottom of the cell, in combination with the adjustable aperture in said cell bottom, when the relation between the width of the pocket and maximum size of the aperture is such that the pocket will always embrace the aperture.

8. SEEDING MACHINES; C. W. Cahoon, Assignor to J. B. Cahoon and D. H. Furbish, Portland, Maine; patented September 1, 1857; re-issued May 11, 1858.

Claim—1st, The employment of a tubular chamber or discharger, rotating rapidly in a horizontal position, so that its outer edge or periphery will be in a plane vertical, or nearly vertical, to the horizon, and thereby communicating a centrifugal motion to the grain, seed, &c., away from the centre of a circle whose plane is thus vertical, or nearly vertical, to the horizon. 2d, The employment of a funnel-shaped discharging chamber having spiral flanches, or their equivalents, inserted therein, and operating to arrest the too direct flow of the grain or seed, &c., through the discharger, and retaining it therein until the necessary centrifugal force is communicated to it before it leaves the discharger. 3d. The combination of the claimed tubular or funnel-shaped discharging chamber with the disk. 4th, The combination of the claimed tubular or funnel-shaped discharging chamber, whether with or without the use of the disk, with a hopper constructed of any proper material, and fitted with the slide and rock shafts with teeth attached, or their equivalents, to feed the grain, seed, &c., into the discharging chamber.

9. MACHINERY FOR SEPARATING FLOUR FROM BRAN; Issachar Frost and James Monroe, Albion, Michigan, Assignors to Henry A. Burr, Israel D. Condit, Alexander Swift, Daniel Barnum, and John M. Carr, City of New York; patented February 27, 1849; re-issued March 13, 1855; re-re-issued May 11, 1858.

Claim—1st, The vertical, or nearly vertical, position of the bolt. 2d, A surrounding case forming a chamber or chambers around the bolt, and provided with suitable means for the delivery of the flour. 3d, A rotating distributing head at or near the upper end of the bolt. 4th, Rotating beaters or fans within the bolt. Also, in combination with the 1st, 2d, and 4th features of the combination first claimed, the closed up top of the bolt, except an aperture or apertures for the admission of the material and air. Also, in combination with the 1st, 2d, and 4th features of the combination first claimed, the closed up bottom of the bolt proper, except an aperture or apertures for the discharge of the bran; whether the said bottom be or be not specially provided with an aperture or apertures for the admission of air. Also, in combination with the third combination claimed, or the equivalent of the features thereof, the employment of rotating arms or wings moving in close proximity with the inner surface of the closed up bottom. And finally, the combination of all the features as essential features, or any equivalents, for any or all the said features.

10. MANUFACTURE OF INDIA RUBBER; Henry B. Goodyear, City of New York, Administrator of Nelson Goodyear, deceased; patented May 6, 1851; re-issued May 18, 1858.

Claim—The combining of sulphur and india rubber, or other vulcanized gum, in proportions, when the same is subjected to a high degree of heat, according to the vulcanizing process of Charles Goodyear, for the purpose of producing a substance or manufacture possessing the properties or qualites: and this I claim whether the said compound of sulphur and gum be or be not mixed with the other ingredients.

11. MANUFACTURE OF INDIA RUBBER; Henry B Goodyear, City of New York, Administrator of Nelson Goodyear, deceased; patented May 6, 1851; re-issued May 18, 1858.

Claim—The new manufacture, and possessing the substantial properties and composed of india rubber, or other vulcanizable gum and sulphur, and, when incorporated, subject to a high degree of heat: and this I claim whether other ingredients be or be not used in the preparation of the said manufacture.

12. MACHINE FOR SOWING FERTILIZERS; Warren S. Bartle, Newark, Assignor to Lyman Bickford and Henry Hoffman, Macedon, New York; patented April 22, 1856; re-issued May 18, 1858.

Claim—The combination of two or more vertical shafts provided with arms, with the outlet tubes of a machine for sowing fertilizers, &c.

13. Cooking Stoves; Austin Bronson, East Portchester, Connecticut; patented August 22, 1848; re-issued May 18, 1858.

Claim—The employment of the heat equalizing chamber interposed between the fire chamber and the oven, when used in combination with, and made to communicate directly with, the flues below the oven.

14. Sewing Machines; T. J. W. Robertson, City of New York; patented February 26, 1856; re-issued May 18, 1858.

Claim—Imparting the necessary motion to the looper, by means of the thread.

15. Cutting Device for Harvesters; Henry Green, Ottawa, Illinois; patented March 21, 1854; ante-dated September 21, 1853; re-issued May 25, 1858.

Claim—Placing the blade or the cutting teeth of a harvesting machine on the vibrating bar to which they are secured, so that the said blade or cutting teeth may extend back and behind such bar.

16. Mowing Machines; Henry Green, Ottawa, Illinois; patented March 21, 1854; ante-dated September 21, 1853; re-issued May 25, 1858.

Claim—1st, A cutting apparatus behind the driving-wheel of a machine adapted to mowing, when this is combined with a tongue or pole hinged, and with proper means for causing the cutting apparatus to run in close proximity with the ground. 2d, Arranging and combining the finger beam with the rear end of the main frame of the gearing, in such manner that while the portion of the finger beam to which the cutting apparatus is secured extends below the frame and may run close to the ground, the rear end of the frame will be carried above the stubble, and this relative position of the rear end of the frame of the finger beam and of the ground will not be disturbed by the rising and falling of the finger beam. or of the driving-wheel to follow inequalities in the surface of the ground in their respective paths. 3d, The combination and arrangement of a metallic shoe, the finger beam, and gearing frame.

17. Reel Supports in Mowing Machines; Henry Green, Ottawa, Illinois; patented March 21, 1854; ante-dated September 21, 1853; re-issued May 25, 1858.

Claim—The method of supporting the reel upon the end of the finger beam without obstructing the action of the divider, by means of inclined arms.

18. Cutting Device for Harvesters; Henry Green, Ottawa, Illinois; patented March 21, 1854; ante-dated September 21, 1853; re-issued May 25, 1858.

Claim—1st, A vibrating cutter having any proper form of cutting edge in front, and notched or indented in the rear thereof, in combination with guard fingers across which it vibrates. 2d, The combination of a cutting edge at the front of a vibrating cutter for severing the stalks of grass or grain, with a cutting edge at the rear for cutting up and facilitating the discharge of obstructing matter.

Designs.

1. Cook Stoves; R. Wheeler and S. A. Bailey, Utica, New York; dated May 4, 1858.
2. Clock Case Fronts; Samuel B. Jerome, Waterbury, Connecticut; dated May 4, 1858.
3. Tool Boxes; Herrick Aiken, Franklin, New Hampshire; dated May 11, 1858.
4. Cook Stoves; T. H. Wood and J. E. Roberts, Utica, and H. S. Hubbell, Buffalo, New York; dated May 11, 1858.
5. Cook Stoves; S. W. Gibbs, Assignor to Rathbone & Co., Albany, New York; dated May 11, 1858.
6. Parlor Stoves; S. W. Gibbs, Assignor to Rathbone & Co., Albany, New York; dated May 11, 1858.
7. Stove Doors; Jacob Beesley, Assignor to John S. Clark and Washington Harris, Philadelphia, Pennsylvania; dated May 11, 1858.
8. Set of Printing Types; George Bruce, City of New York; dated May 25, 1858.
9. Towell Stands; Nathaniel Waterman, Boston, Massachusetts; dated May 25, 1858.

The claims on the above, are for the several shapes, forms, ornaments, and configurations.

ABSTRACTS OF SPECIFICATIONS OF RECENT PATENTS.

FROM H. HOWSON'S PATENT AGENCY, PHILADELPHIA.

For the Journal of the Franklin Institute.

Improvement in Hand Saws. Patent granted to Henry Disston, of Philadelphia, Assignee of Hiram Smith, Camden, New Jersey, May 18, 1858.

This invention relates to an improvement in the combined hand saw and square, for which Letters Patent were granted to Jackson Gorham, of Bairdstown, Georgia, May 12, 1856; and the improvement consists in securing direct to the saw blade, and adjacent to, but independent of, the handle, certain metal strips which form the butt or stock of the square, so that the said strips may always remain at right angles to the upper edge of the saw blade, and may not be disturbed by any loos-

ening of the handle, which is secured to the blade by separate attachments. Above the upper edge and at or near the point where it meets the strips, is a sharp projection, from which to the end of the blade the latter is graduated into feet, inches, and suitable fractions of an inch, the sharp projection in conjunction with the graduated scale, serving to measure and mark off the measurement of lumber and other objects.

Fig. 1 in the annexed engraving represents a hand saw with H. Disston's improvement.

Fig. 2 a sectional plan on the line 1 2 (fig. 1).

A is the blade of the saw secured to the handle B, by the ordinary screws *a*. To each side of the blade is riveted a metal strip C, the handle fitting against the inside of the projecting flanches *c*, of the said

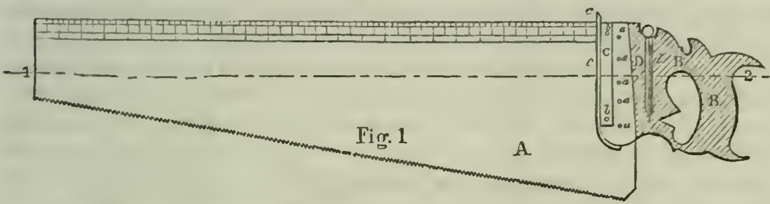


Fig. 1

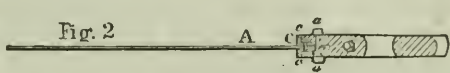


Fig. 2

strips, on each side. The outside of the projecting flanches are situated at right angles to the upper edge of the saw blade, which thus forms the blade of the square of which the strips C, are the butts. Continuations of the flanches *c*, project above the upper edge of the saw blade, both being reduced to a sharp cutting edge so as to form a marker. From this sharp edged projection the upper edge of the blade is graduated into feet, inches, and fractions of an inch.

In the handle B, is an orifice for the reception of a marker D, a spring *d*, secured to the bottom of the orifice serving the purpose of retaining the marker in its proper position within the handle when it is not required for use. In Gorham's patent, above alluded to, the handle of the saw is so constructed as to form of itself the butt of the square, and as it is apt through constant strains and hard usage to become loose, it is evident that when this occurs the instrument will cease to be of any utility as a square. By securing metal to metal, however, as above described, there is no danger of the strips C, moving from their original position, which cannot be changed by any loosening of the handle, inasmuch as the latter is secured to the blade by independent attachments. As the upper edge of the saw blade is graduated into definite lengths from the extreme end of the blade to the sharpened projection *e*, the latter must serve the very useful purpose of marking off the distances determined by the blade in measuring long pieces of lumber, and other objects, and the saw thus arranged will obviate the necessity of a carpenter carrying the ordinary detached rule and pencil, or other marker.

Note.—Manufactured by Henry Disston, Philadelphia, who has recently obtained a

patent for another improvement in hand saws; which consists in imbedding in the handle, two spirit levels, one being parallel with, and the other at right angles to the back edge of the blade, so that the latter can be used either for leveling purposes or as a plumb rule.

Improved Mode of Preventing the Rapid Destruction of Gas Retorts. Patent granted to ALFRED MONNIER, Camden, New Jersey, February 26, 1857.

This invention consists in placing metallic retorts within a casing of baked fire-clay, between which and the metal, intervenes a space in which is packed any substance or combination of substances which will not, when heated, combine with either the iron or the clay. The invention has for its object the prevention of the rapid destruction of metallic retorts resulting from the ordinary mode of exposing them to the action of the fire. The packing in the intervening space has the advantage of allowing the metal and clay to expand and contract independently of each other, thereby avoiding the cracking of the clay, the certain result when the retorts are only covered with clay in the usual manner.

In carrying his invention into practice, the patentee places the metallic retort within a hollow cylinder of baked fire-clay, one end of which rests on the front, and the opposite end on the back wall of the furnace. A circular plate of fire-clay is then cemented into the back end of the clay cylinder in such a manner that it may be readily removed when necessary.

The space between the cylinder and the retort is about three-eighths of an inch; there is also a space of similar width at the rear end of the retort, and in these spaces is packed either asbestos, plumbago, baryta, alumina, magnesia, or any other substance which will not combine with, or in any way affect the integrity of, either the clay or metal when the latter are heated. The above substances, or their equivalents, may be used either alone, or two or more of them may be mixed together and packed into the space in the state of dry or slightly moistened powder.

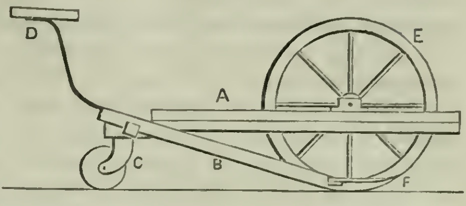
This mode of protecting retorts is especially applicable to such as are used for the manufacture of sodium.

Improvements in Mowing Machines. Patent granted to WM. CROOK, of New Hope, Bucks Co., Pennsylvania, April 13, 1858.

This invention relates to an improvement in that class of mowing machines in which the cutter frame is hinged to the main frame, and the improvement consists in securing the driver's seat to the cutter frame, and so far behind the centre of vibration of the latter that the weight of the driver may act as a counterbalance, or nearly so, to the cutting apparatus, and thus lessen its friction on the ground; that the driver may, by simply changing the centre of gravity of his body, raise the cutting apparatus from the ground, and allow it to fall again; and that the driver's hands may be at liberty for the proper management of his horses during the operation of the machine.

The annexed diagram will suffice to illustrate this invention.

A represents the main frame of the mowing machine; B the cutter frame jointed to the rear of the main frame; E the main driving-wheel; C a castor for supporting the rear of the main frame, and D the driver's seat.



This is situated at such a distance behind the point where the cutter frame is hinged to the main frame, that the driver may by leaning backwards or forwards raise the cutter frame, so that it may be free from any obstructions which may present themselves, and as easily allow it to fall by its own weight and without the aid of the usual mechanical appliances for effecting the same purpose.

MECHANICS, PHYSICS, AND CHEMISTRY.

Electric Lights.

To the Editors of the Mechanics' Magazine.

GENTLEMEN:—I wish to reply to a communication inserted in your Number for Dec. 26, 1857, signed "A Reader of long standing," relative to the electric light. If your correspondent referred to a lamp used some years ago by the Electric Power, Light, and Color Company, his remarks would have been correct. These, however, will no longer be applicable to the lamp at present possessed by the said Company, in which all the defects named by him are remedied.

The lamp to which I refer was invented and made by me: patented April 3, 1855; No. 739; and sold by me to the Company the same year.

With regard to his remarks on batteries, I agree with him that great improvements have yet to be made. Our knowledge of electricity is in its infancy, but, as we advance in information, it does not seem unreasonable to expect that we may succeed in the construction of batteries vastly superior to those at present known in power, economy, and portability.

Electric lamps may be classed under four heads.

First, those in which the separation of the electrodes is produced and regulated by clock-work, or other mechanism acting independently of the electric current.

Second, those in which the mechanism, although depending upon the electric current for its action, remains inoperative until that current ceases, from the resistance offered to its passage by the increased separation of the electrodes.

Third, those in which a carbon disk and pencil, or two carbon disk electrodes are used.

I agree with you, Messrs. Editors, as to the causes which have led to the failure of the above three lamps.

With your permission, I will endeavor to describe briefly the construction and operation of my lamp—the *fourth.*

I use two electro-magnets, the coils of which are traversed by the same electric current. To the armature of one of these magnets I attach the lower or negative carbon electrode; to the armature of the other magnet a brake is attached, which acts on the periphery of a wheel attached to the axis of a drum, around which a chain or cord is wound; to the other end of the chain a weight is hung, which carries off the upper or positive carbon electrode. When uninfluenced by the electric current, the brake does not press upon the wheel, and the weight descends by its own gravity, carrying the upper electrode with it, until it comes in contact with the lower one. But upon connexion being made with the battery, the following action takes place:—

Both magnets acting simultaneously, the armature which is attached to the lower electrode is drawn down UPON its magnet, whilst the brake is made to press upon the wheel by the armature attached to it being drawn TOWARDS the magnet which governs it; the upper electrode is thus prevented from descending, and the separation of the electrodes necessary for the production of the light is at once made. The brake armature is adjusted so that it shall remain at a considerable distance from the magnet; it is therefore sensible to any VARIATION which takes place in the force of the electric current.

Thus, when the distance between the electrodes increases from their gradual consumption, the resistance to the passage of the current becomes greater, and the power of the magnets is diminished. The brake is then liberated from the wheel, and the upper electrode descends until, by its APPROACH to the lower one, the resistance to the current is diminished, when the break is again drawn on to the wheel, and the further descent of the electrode is arrested. It is thus supplied exactly in proportion to its consumption. The consumption, in fact, is the governing power of the supply.

The average variation of the distance between the electrodes does not exceed $\frac{1}{800}$ of an inch.

The armature to which the lower electrode is attached is practically unaffected by the variations which take place in the force of the current, as it is almost in contact with its magnet, being only separated from it by a piece of card. Its office it merely to make the separation of the electrodes when the lamp is first put in action; but in case of accident, such as either of the electrodes being broken off so as to cause a total cessation of the current, the armature of the lower electrode would rise, whilst the upper electrode would descend until it came in contact with the lower one, when the same action would take place as at the starting, and the light would be immediately re-established.

This lamp requires no re-adjustment so long as the same battery power is used. Its construction is perfectly simple, therefore not liable to derangement. It requires no attention after being put in action.

When furnished with a sufficient battery and good electrodes, it has

never yet failed to give a constant and steady light. I have proved this many times, both publicly and privately; and it has frequently been burning for seven or eight hours consecutively, and would burn for any given time in proportion to the length of electrodes and condition of the battery. I am, &c.,

HENRY CHAPMAN.

London, Jan. 4, 1858.

For the Journal of the Franklin Institute.

Particulars of the Steamer Orizaba, No. 2.

Hull built by I. Simonson. Machinery by the Allaire Works, New York. Intended service, Gulf of Mexico.

HULL.—			
Length on deck from fore part of stem to after part of stern post, above spar deck,		210 feet.	
Breadth of beam at midship section, above the main wales,		30 "	
Depth of hold,		10 "	6 inches.
Draft of water, at load line,		6 "	
" " below pressure and revolutions,		6 "	
Area of immersed section at this draft,	150 sq. ft.		
Tonnage,	630.		
Masts and rig—schooner.			
ENGINE.—Vertical Beam.			
Diameter of cylinder,			44 inches.
Length of stroke,		10 feet.	
Maximum pressure of steam in pounds,	35.		
Maximum revolutions per minute,	23.		
BOILER—One—Return flued.			
Length of boiler,		32 feet.	
Breadth "		12 "	
Height " exclusive of steam chimney,		9 "	
Weight of " without water,	51,000 lbs.		
Number of furnaces,	3.		
Length of grate bars,		7 "	
Number of flues,	15.		
Internal diameter of flues,	5,		17 inches.
	5,		13 "
	2,		20 "
Length of upper flues,		19 "	5 "
Diameter of smoke pipe,		4 "	
Height " "		40 "	
PADDLE WHEELS.—			
Diameter,		26 feet.	
Length of blades,		6 "	
Depth "			18 inches.
Number "	24.		

Remarks.—Frames, 15 by $5\frac{1}{2}$ inches; distant apart at centres, 24 inches. Hull strapped with diagonal and double-laid iron braces, 4 by $\frac{5}{8}$-inch.

C. H. H.

For the Journal of the Franklin Institute.

Particulars of the Steamer Bremen.

Hull and machinery built by Caird & Co., Greenwich. Owners, North German Lloyds'.

Hull.—

Length on deck,	328 feet.	
Breadth of beam (molded),	40 "	2 inches.
Depth of hold,	26 "	
" " to spar deck,	33 "	7 "
Tonnage,	2500.	
Masts—three—rig, barque.		

Engine.—Vertical Trunk.

Diameter of cylinders,		90 inches.
Length of stroke,		3 feet 6 "
Maximum pressure of steam in pounds,	25.	
Maximum revolutions per minute,	50.	

Boilers.—Four—Return tubular.

Propeller.—

Diameter of screw,		17 feet.
Pitch "		30 and 33 "
Number of blades,	3.	

Remarks.—Sketch of shape Z, depth, 6 ins.; width of web, $\frac{11}{16}$-in.; width of flanches, $3\frac{1}{2}$ ins.; thickness of plates, $\frac{15}{16}$ to $\frac{3}{8}$-inch. Nine bulkheads. Iron plate water-ways on each deck, 30 ins.$\times\frac{1}{2}$-inch, and 36 ins.$\times\frac{5}{8}$-inch. Also, tie beams, 12 ins.$\times\frac{1}{2}$-inch, on each side of hatch combings. Also, frame ties, $2\frac{1}{2}\times\frac{3}{4}$-inch. 12 ins. apart from floor to main deck.

C. H. H.

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*On the Manufacture of Puddled or Wrought Steel, with an account of some of the Uses to which it has been applied.** By William Clay, of the Mersey Steel and Iron Works, Liverpool.

In the paper which I am now about to submit to your notice, I have endeavored to treat of this comparatively new process, viz: the manufacture of puddled or wrought steel, with an account of some of the uses to which it has been applied, only in a mechanical and practical point of view, and to avoid entirely any questions as to the chemical change which takes place in the conversion of the crude cast iron into steel; and I have also endeavored to avoid instituting any comparisons between this process and any others which seek the same result, viz: the manufacture of cheap steel.

It will be well known to many interested in the manufacture of metals, and more especially to any who may have lately had occasion to visit the continent of Europe, that the manufacture of puddled steel has now been practised there for many years, and that the make is rapidly increasing, but as yet, the uses to which this material has been put are very limited when compared with the vast advantages which would be derived from adopting so strong and durable a material, when produced at a moderate cost.

* From the Journ. Society of Arts, No. 270.

The process I am about to describe, was patented in the year 1850, by Mr. Ewald Riepe, and it may be asked how it comes to pass that so valuable a patent has been allowed to remain almost entirely unknown in this country, when it was granted so long ago as 1850. One reason is the bad state of health of the patentee, who has seldom been able to devote more than a few days, at any one time, to the subject in this country, without becoming so ill as to be incapacitated from attending to business again for a considerable time. Another reason (as I am informed) is that the patentee, about the date of the patent, came over here and entered into working arrangements with one of the most important firms in this country, viz: the Lowmoor Iron Company, who have, up to this time, made about 1000 tons of the puddled steel, but who have not, I believe, carried the manufacture of it beyond the puddling process, but have sold the puddled bars to various Sheffield houses for them to carry into the further stages of manufacture, and more especially to Messrs. Naylor, Vickers & Co., of that town, who have used this material very largely for the manufacture of their cast steel bells, which, I may mention by the way, are also the subject of another patent by the same inventor.

In describing the process of making the puddled steel, I cannot do better than read an extract from the specification of the patentee:—

Riepe's Patent.—"These improvements consist—Firstly, In a peculiar method of working in the puddling furnace. Secondly, In converting pig iron, or alloys of pig iron and wrought iron, into steel, with the co-operation of clay in the furnace. Thirdly, in or by the co-operation of atmospheric air.

"Firstly. I employ the puddling furnace in the same way as for making wrought iron. I introduce a charge of about 280 ℔s. of pig iron, and raise the temperature to redness. As soon as the metal begins to fuse and trickle down in a fluid state, the damper is to be partially closed in order to temper the heat. From 12 to 16 shovelfuls of iron cinder discharged from the rolls or squeezing machine are added, and the whole is to be uniformly melted down. The mass is then to be puddled with the addition of a little black oxide of manganese, common salt, and dry clay, previously ground together. After this mixture has acted for some minutes, the damper is to be fully opened, when about forty pounds of pig iron are to be put into the furnace, near the fire bridge, upon elevated beds of cinder prepared for that purpose. When this pig iron begins to trickle down, and the mass on the bottom of the furnace begins to boil and throw out from the surface the well known blue jets of flame, the said pig iron is raked into the boiling mass, and the whole is then well mixed together. The mass soon begins to swell up, and the small grains begin to form in it and break through the melted cinder on the surface. As soon as these grains appear, the damper is to be three-quarters shut, and the process closely inspected while the mass is being puddled to and fro beneath the covering layer of cinder. During the whole of this process the heat should not be raised above cherry redness, or the welding heat of shear steel. The blue jets of flame gradually disappear, while the formation of grains

continues, which grains very soon begin to fuse together, so that the mass becomes waxy, and has the above-mentioned cherry redness. If these precautions are not observed, the mass would pass more or less into iron, and no uniform steel product could be obtained. As soon as the mass is finished so far, the fire is stirred to keep the necessary heat for the succeeding operation—the damper is to be entirely shut, and part of the mass is collected into a ball, the remainder always being kept covered with cinder slack. This ball is brought under the hammer and then worked into bars. The same process is continued until the whole is worked into bars. When I use pig iron made from sparry iron ore, or mixtures of it with other pig iron, I add only about 20 lbs. of the former pig iron at the later period of the process, instead of about 40 lbs. When I employ Welsh or pig iron of that description, I throw 10 lbs. of best plastic clay, in a dry granulated state, before the beginning of the process, on the bottom of the furnace. I add at the later period of the process, about 40 lbs. of pig iron, as before described, but strew over it clay in the same proportion as just mentioned.

"I do not claim the commencement of the above described process for making steel in the puddling furnace. But what I claim is the regulating the heat in the finishing process, and excluding the atmospheric air from the mass in the manner as described, and also the use or addition of iron to the mass towards the later part of the process."

The remainder of the specification it is not necessary to allude to.

The balls, instead of being rolled into bars, may be hammered into slabs or blooms, for such use as forgings, rails, plates, or any hammered or rolled steel which requires to be perfectly solid; but for ordinary use, puddled bars are made, at the Mersey Iron Works, from 2 to 14 ins. wide, which are afterwards cut up and piled for various purposes.

In using the puddled bar steel, it has been found very desirable to test each bar before using it, and to closely inspect the quality, and to select such as is best adapted to the purposes required, for instance, for steel rails, or railway points, or switches, which I roll at one operation direct to the regular taper-form desired, under a patent which I have "for rolling iron or other metals of taper form." I select the most crystalline steel for the upper and under surface of the rail or switch, and for the interior that which is of a more fibrous and tougher description. Between the centre and top and bottom of the rail, I place steel of an intermediate grade, which causes the whole pile or mass to weld up easily and work solid.

It is necessary in this, as in any operation in which steel is used, to take the greatest possible care in the heating and working of the material; but from the first commencement there has been found no difficulty in heating, rolling, or forging this steel into any form or shape, as it has been made into steel plates, bars, angle steel, rivet steel, rails, railway points, and forgings of all kinds with perfect ease and with success, and ever since the manufacture was commenced at the Mersey Steel and Iron Works, this steel has been used for almost everything that was required to be of a strong and durable nature, or to repair any of those breakages which are of such constant occurrence in every iron work.

It is somewhat worthy of remark that, although this process is so novel, and, apparently, of so delicate a nature, yet, with the specification as my only guide, having never before heard of or seen the operation, it succeeded perfectly in the first trial which was made, and produced so excellent a steel that, after working about 100 tons, it has hardly been surpassed. I have used pig iron of all descriptions, North Welsh, South Welsh, Staffordshire, and Scotch, with the same result, viz: the production of an excellent steel; but I have not found, so far, anything like the great difference that I expected between hot and cold blast iron. Most excellent results have been obtained from both; this is more particularly important as it shows that the extent to which this manufacture may be carried need not be circumscribed by the very limited supply of cold blast pig iron.

Having thus described the process of manufacture, it will be necessary to show a few of the qualities of the material produced.

The puddled steel bar when broken shows a clear crystalline and even fracture, and has the usual sonorous musical tone when struck. The crystals appear much finer and more regular than in ordinary blister steel, in fact, to the unpractised eye, the appearance is quite like that of the best cast steel, and it has all these distinguishing features by which steel is known from iron. It hardens to any degree that may be requisite, taking all the colors which develop themselves under the different degrees of heat, and may be made into such articles as ordinary chisels direct from the puddled bar; it will take a very fine polish, and has the same amount of elasticity that steel usually possesses.

In fact, I believe it to be useful in the Arts for all purposes for which steel is required, except, perhaps, for the finer descriptions of tools and cutlery.

One extraordinary feature in regard to this wrought steel is, that it can be produced either of a harsh, hard, unyielding character, or of a soft, silky, fibrous structure, or of any of the grades between these two points, and that a bar when quite cold may be bent up double and perfectly close (with extreme difficulty certainly on account of the great stiffness of the material) without the slightest sign of fracture, but, when forced back again, a beautiful long silky fibre is apparent: or if a piece of steel plate be partly cut through with a chisel and then broken, it appears beautifully fibrous; if made into a tool, for instance, and hardened, it at once assumes the crystalline character peculiar to steel.

In a series of experiments with regard to the improvements and deterioration which result from oft-repeated heating and laminating of bar iron, (undertaken when writing a paper on "The Forging of Wrought Iron in Large Masses," for a work entitled "The Useful Metals and their Alloys," and detailed at page 318 of that work), I found "that taking a quantity of ordinary fibrous puddled iron, and reserving samples marked No. 1, we piled a portion five high, heated and rolled the remainder into bars marked No. 2; again reserving two samples from the centres of these bars, the remainder were piled as

before, and so continued until a portion of the iron had undergone twelve workings.

"The following Table A shows the tensile strain which each number bore:—

No.		lbs.
1.	Puddled bar,	43,904
2.	Re-heated,	52,864
3.	"	59,585
4.	"	59,585
5.	"	57,344
6.	"	61,824
7.	"	59,585
8.	"	57,344
9.	"	57,344
10.	"	54,104
11.	"	51,968
12.	"	43,904

"It will thus be seen that the quality of the iron increased up to No. 6 (the slight difference of No. 5 may perhaps be attributed to the sample being slightly defective), and that from No. 6 the descent was in a similar ratio to the previous increase."

In a somewhat similar series of experiments undertaken with this steel, it appears that, after the first piling, when the bars become solid, a deterioration in respect to tensile strength takes place, which is slow and gradual, but in a regularly increasing degree, as will be found by the following Table B:—

No 1.	Puddled steel	bar bore	96,911	lbs.	per square inch.
2.	Piled	"	121,408	"	"
3.	"	"	111,608	"	"
4.	"	"	121,408	"	"
5.	"	"	111,608	"	"
6.	"	"	111,608	"	"
7.	"	"	91,136	"	"
8.	"	"	91,136	"	"
9.	"	"	91,136	"	"
10.	"	"	91,136	"	"

MEM.—The weight increased 20 cwt. at a time.

The steel used for these trials was what chanced to be at hand, and was not particularly remarkable for any extraordinary degree of strength. The appearance of the fracture of the sample bars, when broken by the hammer in the usual manner, presents to the eye a very slight difference, the color and size of the crystals being, to all appearance, much the same in No. 2 as in No. 10; but when torn asunder by a machine for the purpose, a very marked difference is observable, the higher numbers having a very fibrous silky fracture; and yet the characteristics of steel are perfectly preserved, for No. 10 hardens, takes the usual colors, in fact, possesses all the distinguishing properties of steel.

I would wish especially to call attention to this steel as a material for large forgings and for ordnance purposes.

It is generally understood in this country that cast steel has been, to a certain extent, a failure for such uses, and that it has been found that, unless a considerable amount of hammering and rolling be ap-

plied to the cast steel material subsequently to the founding process, the strength of such cast steel material is very inferior to that where it has been consolidated by the action of the hammer or the rolls, and that it is not at all suitable where sudden strains are inevitable.

Mallet, in his valuable work on "The Construction of Artillery," argues that cast steel is not suited for ordnance on account of its deficiency in point of elasticity when compared with wrought iron or gun metal.

I imagine that this want of elasticity may be partially accounted for in this manner, viz:—Cast steel requires a very high temperature to render it fluid for founding, which necessarily causes a considerable amount of shrinking in the casting when passing from the fluid to the solid state, and the casting is of that peculiar crystalline structure which is produced under such conditions (weakened to a great extent also by the strain caused by shrinkage), unless the steel casting is afterwards subjected to the hammering or rolling process before mentioned, by which the particles of steel are relieved from their shrinking strain, and are consolidated and allowed to assume a comparative state of repose.

In the manufacture of forgings from puddled steel, the case is very different. We possess, in the best puddled steel, as great, if not a greater amount of strength, as in cast steel under the most favorable circumstances, and as the particles of wrought or puddled steel are never in a state of fusion from the time of their first formation in the puddling furnace, the enormous contractile strain incident upon the transition of the steel from the fluid to the solid state, is avoided in the first place, and also the grain of the puddled steel may be so placed in the forging to be made, as the strain which it will be called upon to resist may require, and the different descriptions of steel, whether crystalline or fibrous, may be arranged in the best positions as regards strength and durability. Take, for instance, a large gun forging; the interior may be made of hard crystalline steel, to resist the enormous wear and tear, and the exterior of a softer and more fibrous description, as above described, a result evidently impossible with cast steel, which must necessarily be homogeneous, and be either entirely hard or entirely soft.

It would not surprise me if, with more experience of this new manufacture, it should be found that wrought steel bears the same relative position with regard to cast steel that wrought iron does to cast iron.

There has of late been a considerable controversy respecting an alleged deterioration of wrought iron, when being made into large forgings, from a supposed crystallization of the material employed. I have always endeavored to maintain, and in my work already referred to, I have attempted to show, that where this crystallization took place it was purely the result of carelessness or incompetence.

With wrought steel, the danger from this cause is very materially lessened, indeed, rendered almost impossible, for the heat at which it welds is much less than that required to weld iron, as also if the steel be heated too much (and long before any deterioration from crystalli-

zation could set in) the forging when brought to the hammer would be so tender that it would fall in pieces, and would in that manner be wasted for the purpose required; there is, therefore, little fear that crystallization, otherwise bad workmanship, can materially injure this tell-tale production.

Steel forgings have been made, at the Mersey Steel and Iron Works into piston rods, (some with the piston forged solid, 18 inches diameter, for a Nasmyth hammer), large roll screws, shear pins of all sorts, rolls for rolling iron, hammers and anvils, and for a variety of other purposes. In making these forgings no difficulty was experienced; rather more time was required on account of the necessity of heating the steel slowly, and also because the hammer did not make the same impression on it that it does upon iron.

The effect of forging upon this steel is to consolidate it, and when broken in the usual manner, the appearance of the crystals is much finer than when it is rolled, as might be expected.

Of all the various uses to which this steel may be applied, there are perhaps none so important as its application to marine and railway purposes; for the former use, the material offers directly so considerable saving in regard to weight, with an equal amount of strength (putting out of the question its durability and other advantages) that its universal adoption can hardly be doubted. A commencement has been made by the Board of Admiralty, who have used considerable quantities of Howell's homogeneous metal in the manufacture of marine steam boilers, as stated in the *Times* newspaper of July 6th, which says: "In consequence of the successful trials which have been made at Woolwich, of Messrs. Shortwell, Howell, and Jessup's homogeneous metal, government have given directions for the use of that metal in the construction of steam boilers, one of which is ordered to be made for the 17 gun steam sloop *Malacca*, Capt. Arthur Farquhar."

For railway purposes it is nothing new to propose steel for rails, points, and crossings, &c., as the attention of engineers has long been directed to it, both in this country and abroad, but the difficulty has hitherto been the cost of steel for such purposes. Some attempts have been made to harden the face of rails, and to steel the working parts of tyres, but, I believe, the result has not been altogether satisfactory, and the cost considerable; but with wrought steel, the tyres, points, or rails, may be made altogether of hard crystalline steel, or an outer surface of hard and an inner portion of fibrous steel, as required, and at a cost very materially less than that at which steel has hitherto been produced.

With regard to the ultimate resistance to tension of steel as compared with iron, we find by the tables recently published in the reports of experiments on the strength and other properties of metal for cannon made by officers of the United States Ordnance Department, that the strength of various descriptions of English, American, and Russian wrought iron, tested by them, varied from 53,903 lbs. to 62,644 lbs. per square inch.

The ultimate cohesion of tilted cast steel bars, as published in Table

No. 9 of Mallet's work on the construction of artillery, is stated at 142,222 as the highest, with 88,657 as the mean per square inch.

Other estimates of the ultimate cohesion of steel give,

Tempered cast steel, at . .	150,000 lbs.
Cast steel, ...	134,256 "
Shear steel, ...	124,400 "
Blister steel, . . .	133,152 "

With wrought steel I have also found considerable variation in regard to tensile strength, more particularly when experimenting, as it is necessary constantly to do in a new manufacture, with various descriptions of pig iron and different charges. But when working regularly I have found no more difficulty in obtaining an uniform result than in the manufacture of iron, and with more experience we may safely expect some improvement even in this particular.

The first bar that was tested broke at 173,817 lbs. per square inch. This extraordinary endurance I have not since equalled, the nearest approach to it being 160,832 lbs. per square inch.

The average tensile strength of the steel, however, may be estimated at about 50 tons per square inch, or 112,000 lbs.

Of four samples tested at the Liverpool Corporation chain-proving machine, on the 8th of January, 1858, the first bar, which was made as hard as fire and water could render it, broke at something less than 112,000 lbs., but the exact weight was not ascertained. (This trial bar was from the same steel as No. 3, which, as will be seen, bore the heaviest test in its natural state.) Test bar No. 2 broke at 112,000 lbs., or 50 tons per square inch. No. 3 broke at 125,440 lbs., or 56 tons per square inch. No. 4 broke at 98,560 lbs., or 44 tons per square inch.

Mem.—This last sample had a slight flaw, which probably caused the difference.

Table C.—*Tensile strength of Iron and Steel Bars per square inch.*

Descriptions of Iron and Steel.	Tensile strength.	Authority.
Russian Iron, . .	62,644	
English Rolled Iron, .	56,532	American Board of
Lowmoor " .	56,103	Ordnance.
American hammered, .	53,913	
Krupp's Cast Steel, average of 3 samples, . .	111,707	Minister of War, Berlin.
Cast Steel, highest, .	142,222	Mallet.
" mean, . .	88,657	do.
" " .	134,256	
" tempered, .	150,000	
Shear Steel, . .	124,400	
Blister " . .	133,152	
Mersey steel and Iron Co. Puddled Steel, highest, .	173,817	
Ditto, another sample, .	160,832	
Average of three samples tested at the Liverpool Corporation testing machine, .	112,000	

This steel will also be found most useful for chains and ships' cables, and although the few samples which I have had made all broke at the weld, evidently from want of experience on the part of the smith in working this new material, yet the strains borne at the Liverpool Corporation chain testing machine, even with imperfect welds, are tolerably satisfactory, as will be seen by the following:—

		Govt. proof strain.	
	Tons.	Tons.	Cwt.
Chain 9-16 inch, close link, broke at,	12	3	15
Chain 9-16 inch, stud link, broke at,	13	5	10

TABLE D.—*Tests of Steel, &c.—Bars 2 inches square, 3 feet between supports, weight in the middle.*

	HAMMERED PUDDLED STEEL BAR.				HAMMERED IRON BAR.			
Weight on Centre.	Total Deflection.	Additional Deflection.	Permanent Total Set.	Additional Permanent Set.	Total Deflection.	Additional Deflection.	Permanent Total Set.	Additional Permanent Set.
T. C.								
3 18	·18	Nil	Nil	Nil	·28	Nil	·14	Nil
4 18	·37	·18	·14		1·03	·74	·79	·65
5 18	·75	·37	·51	·37	1·45	·42	1·21	·42
6 18	1·12	·37	·79	·28	2·03	·57	2·25	·90
7 18	1·68	·56	1·31	·51	3 84	1·81	3·60	1·35
8 18	2·15	·64	1·78	·46	4·93	1·09	4·96	1·51
9 18	2 62	·46	2·25	·46				
10 18	3 46	·84	3·09	·84				
11 18	4 12	·65	3·75	·65				
12 18	4 68	·56	4·31	·56				

	ROLLED PUDDLED STEEL BAR.				ROLLED IRON BAR.			
Weight on Centre.	Total Deflection.	Additional Deflection.	Permanent Total Set.	Additional Permanent Set.	Total Deflection.	Additional Deflection.	Permanent Total Set.	Additional Permanent Set.
T. C.								
3 18	·56	Nil	·37	Nil	·84	Nil	·65	Nil
4 18	1·12	·56	·84	·46	1·21	·93	·93	·28
5 18	1·78	·65	1·50	·65	2·15	·37	1·87	·93
6 18	2 57	·79	2·25	·75	3·56	1·40	3·28	1·40
7 18	3·37	·79	3·00	·75	5·06	1·50	4·68	1·40
8 18					6·75	1·68	6·37	1·75
9 18								
10 18								
11 18								
12 18								

Table D gives the deflection of hammered and rolled bars of steel and iron with increasing weights.

The samples, as I have since discovered, were of too soft a descrip-

tion, and better results would have been obtained with harder steel, or perhaps the best results might be obtained by a mixture of hard and soft steel, the hard being placed above the neutral axis, the part which is deflected by compression, and the soft, which is deflected by extension, below.

In experimenting upon the strength of this steel, I found the weight requisite to punch steel and iron plates was relatively as follows. The plates were all ¼-inch thick, and the size of the punch ½-inch (circular).

	Tons.	Cwt.
Ordinary boiler plates, punched with a pressure of . . .	8	18
Charcoal, ...	8	3
Steel, ...	15	10

In several trials of the tensile strength of steel plates, it was found that the strain required to break a square inch of this steel, varied from 44 to 55 tons.

It may perhaps be well to mention also, that there is no difficulty in working this steel, either hot or cold, in any manner in which the best descriptions of iron are worked, and that no particular knowledge or skill is required on the part of the workmen who use it.

These results show the importance of steel as a material for boilers and shipbuilding purposes, as also for girders and bridges, as the economy in the weight of material required is of the greatest importance for these and for many other similar purposes.

In conclusion, I beg to apologise for the very imperfect paper that I have had the honor of laying before you, but I would plead in excuse the very limited time that has elapsed since I first commenced the manufacture of this material, and also that, from the extraordinary and novel nature of this steel, I have been often much perplexed and puzzled, and have had to renew experiments again and again before I could fully comprehend the sometimes apparently contradictory facts which presented themselves, and added to this that it was in the first place necessary to unlearn a good deal of what I had always been accustomed to look up to as the foundation of all knowledge of the iron and steel manufacture, a task much more difficult than the acquisition of any new idea, when the mind is not occupied with preconceived notions and old established prejudices.

In the experiments which I have tried, I have taken every care to be as accurate as possible, and as the trials have gone on, I have had more and more cause to feel confidence in the result obtained, and, had time permitted, I should have been glad to have extended the trials, as the more I investigated the nature of this material the more satisfactory I found it.

I do not for a moment anticipate that steel manufactured by this patent process will supplant the best description of steel, but I feel confident that it must come largely into use for most ordinary purposes, where cast steel, from its great cost, cannot be used.

Indeed, if I might indulge somewhat in prophecy, I would express my belief that, in a few years, the manufacture of this wrought steel

will have become as important a branch of our national industry as that of iron now is.

If the few facts which I have, however imperfectly, placed before this Society, lead to further inquiry by others more competent, and having more leisure to conduct them to a successful issue, I shall be amply repaid for the time and pains that I have bestowed upon the subject.

For the Journal of the Franklin Institute.

Final Success of the Voyageur De Le Mer.

This steam yacht sailed from India wharf, Boston, at $10\frac{1}{2}$ A. M., on the 30th of June, and returned at 4 P. M. the next day. She went down the harbor under steam alone, then was worked under steam and sail together till sunset, when the propeller was disconnected, and the vessel was worked under canvass alone till about 10 A. M. the next day, when the propeller was again coupled and the sails furled, and the vessel steamed back to her port against a fresh wind. The run from the light ship at Minot's Ledge to Boston Light, nine statute miles, was made in $55\frac{1}{2}$ minutes, the tide being about slack water. This, considering the strong wind ahead, was the best part of her performance, but the steam was at no time allowed to follow the pistons more than about $\frac{1}{4}$ stroke, and was kept throttled to check the tendency to prime. The highest number of revolutions was 36. The boiler pressure employed was from 30 to 40 ℔s., but the indicator showed the maximum pressure in the cylinders to have been only about 12 ℔s. The speed made under sail alone was $10\frac{1}{2}$ knots, and under both steam and sail, with a fresh wind, 13 knots.

The particulars of this splendid and quite novel vessel, published in vol. xxxv., p. 397, are correct, except the thickness of the bulkheads. They are of $\frac{1}{4}$ inch iron instead of $\frac{1}{2}$ inch as there given.

The lines of this ship, by Mr. Samuel H. Pook, deserve especial admiration. The hull glides through the water with the same absence of commotion which formed so distinguishing a feature of the late Geo. Steer's constructions.

The principal alterations which have transformed this vessel into a very creditable one, are the addition of a small dome on each boiler, a stiffening of the engines, and an addition of an expansion gear invented by Mr. George A. Corliss, of Providence, for this especial case. This part of the apparatus is worthy of the highest admiration as a triumph of engineering and inventive skill over very extraordinary difficulties. The attention of the Corliss Engine Company had not been attracted to this ship until the latter part of March last, and a contract for the work was not signed until April, yet the vessel is now *en route* for the land of the Pharaohs, with a valve gear constructed some fifty miles from the ship, the first of its kind ever adapted to oscillating engines, and fitted perfectly to the old work, and to the very small amount of space remaining about the same, so that none of the old work had to be displaced or altered. The valves are shut quietly and very promptly

by powerful springs, and are released at any point from commencement up to half stroke, as in the ordinary Corliss engine, while the provision for easy reversing has rarely been equalled.

Although the boilers will probably continue to furnish rather wet steam, the vessel as completed, bids fair to reflect much credit on her constructor. T. D. S.

New York, July 23d, 1858.

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*On the large Blowing Engine and new Rolling Mill at Dowlais Iron Works.** By Mr. W. Menelaus.

The large blowing engine and rolling mill, forming the subjects of the present paper, are particularly remarkable for their great size (the blowing engine being the largest of its class hitherto erected either in this country or abroad), and were designed with a view to turning out a large quantity of work, with the greatest possible security from risk of failure, or deficiency of the blast, or of breakage of the machinery.

The engine was erected in 1851. The blowing cylinder is 144 inches diameter, with a stroke of 12 ft., making 20 double strokes per minute; the pressure of the blast being $3\frac{1}{4}$ lbs. per square inch. The discharge pipe is 5 feet diameter, and about 140 yards long, thus answering the purpose of a regulator. The area of the entrance air-valves is 56 sq. feet, and of the delivery air-valves 16 square feet. The quantity of air discharged at the above pressure, is about 44,000 cubic feet per minute. The steam cylinder is 55 inches diameter, and has a stroke of 13 feet, with a steam pressure of 60 lbs. per square inch, and working up to 650 horse power. The steam is cut off when the piston has made about one-third of its stroke, by means of a common gridiron valve, near the back of the slide-valve: there is also, on one side of the nozzle, a small separate valve, for moving the engine by hand when starting. The cylinder ports are 24 inches wide, by 5 inches long, and the slide-valve has a stroke of 11 inches, with $\frac{1}{2}$ inch lap. The engine is non-condensing, and the steam is discharged into a cylindrical heating tank, 7 feet diameter, and 36 feet long, containing the feed water from which the boilers are supplied. Under the steam cylinder there are about 75 tons of cast iron framing, and 10,000 cubic feet of limestone walling in large blocks, some of them weighing several tons each.

The beam is cast in two parts, of about $16\frac{1}{2}$ tons each, the total weight upon the beam gudgeons being 44 tons; it is 40 feet 1 in. long, from outside centre to outside centre, and is connected to the crank on the fly-wheel shaft, by an oaken connecting rod, strengthened by wrought iron straps. The beam is supported by a wall across the house, 7 feet thick, built of dressed limestone blocks, to which the bearings are fastened down by twelve screw bolts of 3 inches diameter. The fly-wheel is 22 feet diameter, and weighs about 35 tons.

Eight Cornish boilers are employed to supply the steam, each 42 ft. long, and 7 feet diameter, made of $\frac{9}{16}$ inch best Staffordshire plates, and

*From Newton's London Journal, April, 1858.

having from end to end a single 4-foot tube, in which is the fire-grate, 9 feet long.

For some time, this engine supplied blast to eight furnaces of large size, varying from 16 to 18 feet across the boshes; it is now blowing, with three other engines of small dimensions, twelve furnaces, some of which make upwards of 235 tons of good forge pig per week; the weekly make of the twelve furnaces being about 2000 tons of forge pig iron. With the exception of the cylinders, made and fitted at the Perran Foundry, Truro, the engine and boilers were made at the Dowlais Iron Works, and erected according to the design, and under the superintendence, of Mr. Samuel Truran, the Company's engineer.

The engines for driving the new rolling mill, now in course of erection at the same works, are a pair of high pressure engines coupled at right angles. The steam cylinder is 45 inches diameter, with a stroke of ten feet, making 24 double strokes per minute. Each cylinder has a common slide-valve of brass, worked by an eccentric on the main shaft. The expansion valves are of the gridiron sort, worked by a cam on the main shaft, the steam being cut off at about one-third of the stroke; an arrangement is made for throwing these valves out of gear when the engines are doing heavy work. Each engine is furnished with a small slide-valve, to be worked by hand, for the purpose of starting and reversing. The steam is supplied by six Cornish boilers, 44 feet long, and 7 feet diameter, having a 4-foot tube in each; the whole of the plates are best Staffordshire, $\frac{9}{16}$ inch thick, and the total weight is 120 tons. The framing under the engines and machinery is of cast iron, and consists of four lines, each 75 feet long, 12 feet high, and 21 ins. wide; the whole weighing about 850 tons.

Each beam is in two parts, the sides weighing about 17 tons, making the total weight of each beam, when complete, about 37 tons. The two beams are supported upon eight columns, 24 feet long, and $2\frac{1}{2}$ feet diameter, securely fastened at the bottom in deep jaws cast upon the framing. Upon the top of each group of four columns is a large and heavy entablature plate, which carries the plummer blocks under the main gudgeons. Each column passes through the entablature, the bosses at the junction being 24 inches deep; these are bored, and the tops of the columns turned, so as to ensure a perfect fit. The plummer blocks are secured by wrought iron keys in jaws cast on the entablature in the usual manner. The connecting rods are of oak, with wrought iron straps.

The driving-wheel shaft is of cast iron, with bearings 24 ins. diameter; the fly-wheel shaft is also of cast iron, with bearings 21 ins. diameter. The diameter of the driving-wheel is 25 feet to the pitch line; width on the face, 27 inches; and pitch, 7 inches. The diameter of the spur-wheel or pinion on the fly-wheel shaft is 6 feet, and the teeth are strengthened by a flanch running up to their points on each side. The fly-wheel on the mill shaft is 21 feet diameter, and weighs about 30 tons, making upwards of 100 revolutions per minute. The whole of the fastenings, both of the wheels and framing, are of dry oak and iron wedges.

These engines will drive one rail mill capable of turning out 1000 tons of rails per week, another mill capable of making 700 tons of rails or roughed-down per week, and one bar or roughing-down mill capable of making 200 tons per week: they will thus readily turn out 2000 tons of iron per week. Two blooming mills, with three high rolls and two hammers, will also be worked by the same engines. The saws and small machinery will be driven by separate engines, as will also the punching and straightening machines.

The roofs cover a space of 240 ft. by 210 ft., and are to be covered with corrugated black plates of No. 14 wire gauge thickness. The span is 50 feet; the roofs being supported upon lattice girders of an average length of 45 feet.

It has long been felt, that the power of rolling wrought iron of large section and great lengths has not kept pace with the requirements of engineers, who are hampered in their designs by the impossibility of obtaining iron of sufficient dimensions. For engineering works of any magnitude, bars of great length, considerable width, and moderate thickness, are frequently required. In the ordinary mode of rolling, the length and width of the bar are measured by the power of the engine and the time occupied in rolling. It is obvious, that to finish a bar quickly, it is necessary that it should be rolled in two directions, to prevent delay; and long and heavy bars can be thus rolled only by an engine of enormous power. This object is designed to be attained by the large combined engines now described. A simple arrangement of rolls for working in two directions, containing two pairs of rolls, is also employed. The lower pair of rolls is driven from the fly-wheel shaft, and under ordinary circumstances will be worked in the usual manner,—rolling the bars in one direction, and lifting them over the top roll in coming back. When it is necessary to make extra-sized bars, a second pair of rolls is put in the standards, and driven from the fly-wheel shaft by a pair of spur-wheels, thus giving the means of working the iron in both directions. By this arrangement the mill is expected to be able to roll iron of such sections and lengths as have been hitherto unattainable.

Proc. Insti. Mech. Engineers, London.

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*White Brass, or Unoxidizable Cast Iron.**

M. Porel, of Paris, has prepared an alloy which has the appearance and fracture of ordinary zinc, but it is as hard as copper or iron, and tougher than cast iron. It may be turned, filed, or drilled, as easily as those metals; does not adhere to metal moulds, and retains its metallic lustre perfectly in a moist atmosphere. This alloy is prepared by melting together zinc, copper, and cast iron. It contains 10 ℔ cent. copper and 10 ℔ cent. iron. This alloy may be used for various purposes in the construction of machinery; it may be made to appear like bronze, either by covering it with a deposit of metal, or by throwing up the copper superficially, and is, therefore, well adapted for casting vases, statues, and other objects of artistic character that are to be exposed to the atmosphere, especially as it is not a costly material.

* From the London Mining Journal, No. 1173.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, July 15, 1858.

John Agnew, Vice-President, in the chair.

John F. Frazer, Treasurer.
Isaac B. Garrigues, Recording Secretary. } Present.

The minutes of the last meeting were read and approved.

A Letter was read from "La Société Industrielle de Mulhouse," Mulhouse, France.

Donations to the Library were received from the Commissioners of Patents, London; Lieut. J. M. Gillis, U. S. Navy; James P. Espy, Esq., Washington, D. C.; Charles H. Haswell, Esq., New York; Major Robert Walker, St. Louis, Missouri; the Legislature of Pennsylvania, and from George W. Fahnestock, Esq., Professors John F. Frazer, and B. H. Rand, and the Pennsylvania Hospital, Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement of the receipts and payments for the month of June.

The Board of Managers and Standing Committees reported their minutes.

Candidates for membership in the Institute (4) were proposed, and the candidates (4) proposed at the last meeting were duly elected.

Prof. John F. Frazer announced the decease of Abraham Miller, Esq., late Vice-President of the Institute.

On motion of Prof. Frazer, the Corresponding Secretary was instructed to transmit to the Commissioners of Patents, London, the special thanks of the Institute for their valuable donations of English Specifications of Patents, and the accompanying Indexes, &c.

Mr. John H. Cooper exhibited his improved oil cup, the body of which is of the usual form of oil cups for lubricating machinery; on the top is a hollow projection communicating with the interior of the cup. This hollow projection, which represents the frustrum of a cone inverted, is surmounted with a projecting ledge, which serves the purpose of preventing the dust from accumulating near a door way cut into the side of the projection.

A tightly fitting door, opening inwards, is adapted to the door way, and forms part of the conical surface when closed.

The peculiar manner in which the door is hung and weighted, keeps it closed until pressed from the outside by the nozzle of the oil can, when the cup needs replenishing with oil.

There is no opening to the interior of the cup except the aforesaid door way and the outlet for oil to that part of the machinery which is to be lubricated.

For locomotives, where the constant jar and motion would have a tendency to open a weighted door, Mr. C. proposes to use a very light door closed by a spring, which would effectually maintain the door in its closed position.

Oil cups with spring valves have been heretofore proposed and patented; the orifice for the admission of oil, however, has invariably been situated at the top of the cup, the very point where the dust is most likely to accumulate and accompany the flow of oil to the interior when the cup is replenished.

In these cups, too, the springs for closing the valves are situated in the body of the cup, and immersed in the oil, rendering them liable to rapid corrosion as well as inaction from accumulation of dust.

In Mr. C's. arrangement, the spring or weight for closing the door is in the hollow projection, and is always above the oil.

Mr. Howson exhibited an improved head for surveyors' tripods, for which a patent was granted Mr. W. J. Young, of this city, on the 10th of July last.

The invention consists in constructing the plate to which the theodolite and plumb line are attached so as to be adjustable in any direction horizontally to the cap of the tripod, the ordinary leveling screws serving the purpose of securing the plate after adjustment.

The object of the invention is to facilitate the adjustment of the plumb line to any given point on the ground, without the operator having to resort to the usual tedious process of adjusting the legs of the tripod.

Mr. Young's very simple but ingenious improvement, serves the desired purpose admirably, and this, without adding any complication of parts or extra expense.

Dr. Gumpert laid on the table specimens of photo-lithography, made by Mr. Rehn, (under Cuttings' patent;) these were microscopic objects magnified from 100 to 500 diameters, showing the structure with great clearness and beauty. This new process offers a correct, cheap, and beautiful mode of illustrating works of nature or art, as it appears illimitable in its application. Machinery, architectural designs, anatomical objects, and whatever the "camera" is capable of depositing on the prepared stone, may, without artistic aid, be printed from, as in ordinary lithographic work.

A machine desigued to register the number of bushels of grain passed over it, was exhibited by the inventor, Mr. Atkins. It consists of a platform hinged at one end, and sustained by a spring at the other end. The spring is just sufficient to hold up the platform, and yields, when the measure of grain is placed upon it as it passes from the measurer. A pawl near the hinged end, moves with the platform, and when depressed, falls into a tooth of a ratchet wheel, which it turns when rising by the action of the spring, actuating a train of wheels and pointers moving around dial plates; and also, striking a bell to give notice that each one is registered. One dial registers units, the other fifties or hundreds. A bell of different tone is struck when each fifty or one hundred is counted. The wheels and dial plates are enclosed in a box, two glazed apertures permitting the position of the pointers to be seen.

BOARD OF MANAGERS.

Abstract from the Proceedings of a Special Meeting, held at the Hall of the Institute, July 15th, 1858.

On motion of Prof. John F. Frazer, it was

Resolved, That the Board of Managers of the Franklin Institute, have heard with great regret of the death of their late Vice-President, Mr. Abraham Miller, who has been associated with this Board from its earliest organization, and was endeared to his fellow members by his kindly manners and his liberal public spirit.

Resolved, That as a mark of respect to his memory, the Board will attend the funeral in a body.

Resolved, That these resolutions be communicated to the family of the deceased.

BIBLIOGRAPHICAL NOTICE.

Geological Surveys in Kentucky during the years 1856 and 1857. By David Dale Owen, Principal Geologist.

Two years ago, a handsome volume appeared at Frankford and Lexington, giving the results of the geological survey of Kentucky, during the years 1854 and 1855, under the superintendence of Dr. David Dale Owen, assisted by Dr. Robert Peter as chemist, and Mr. Sidney S. Lyon as topographer. We have lately received a second and third volume, with plates of fossils and maps of several of the most important counties of the state, excellently done, carrying forward the description of the survey to the close of the last season, that of 1857. It is evident from an inspection of the volumes that this survey is destined to exercise an important influence upon the future knowledge of American geology, and Dr. Owen deserves the thanks of geologists for publishing so rapidly and fully his results. The important error of duplicating the vertical section of the western coal measures made in the first volume is corrected in the second, and a very complete *coup d'œil* of the state permitted to the reader by the short descriptions of the geology of the counties in their order on the map.

The marked feature of this State Geological Report is the great number of its metallic assays and analyses of coals, limestones, soils and clays, occupying in fact 570 of the 1360 pages of the three volumes, and numbering as high as 775 analyses in all; a body of materials under this head of science, if accurately manipulated, of rare value not only to the economical estimates to be put upon the localities in Kentucky, but to the general chemistry and geology of the globe. The diligence of Dr. Peter is exemplary, as proved by the fact that the average annual number of analyses for the four years of the survey has been nearly two hundred. Those of the mineral waters of the state are of curious interest, especially those of the waters of magnesian springs (vol. i, p. 102; vol. iii, p. 54, &c.) causing the celebrated milk sickness of the west. Those of the soils, subsoils and various

clays are a still more important addition to our stock of agricultural knowledge.

The reports of Mr. Lyon are confined chiefly to the stratography of the two coal regions of the State, where it was undoubtedly of urgent use to commence the survey and do the most finished work. Topography is essential to the right geography and geology of all coal regions; and, even apart from the necessity of a new State map, the old map being at every point unreliable, it was important to map the counties which contain coal. A base line was therefore commenced at Uniontown, on the Ohio River, (latitude 37° 46′ 4″ approximately,) and carried due east through the centre of Third Street, Owensboro' (233,300 feet,) Knottsville (296,318 feet,) and as far as to William Smith's farm in Hancock County (322,975 feet,) where we understand it has been taken up this spring and carried forward toward the eastern coal field south of Maysville, the western outcrop of which it is expected to cross this month. With this base line, when finished, the detailed surveys of Hancock and Hopkins Counties in the west and of Greenup and Carter Counties on the east, already completed, will be tied, and in the subsequent years all the other counties of the state of which detailed surveys may be ordered. This policy of Dr. Owen inaugurates a new era we hope in American geology, setting an example which every state will in turn follow. Base lines in all the states may be run at slight expense and find fixed termini in one or other of the primary triangle stations of the Atlantic, Lake or Gulf Coast surveys. Now that Colonel Graham of the U. S. A. and Lieutenant Ashe of the B. A. have made their important determination of the latitude and longitude of Chicago by telegraphic signals between Chicago and Quebec, the old perplexing error of the lake survey will disappear and the still more extraordinary error of nearly a half a degree of longitude ranging along the western lines of Virginia, North and South Carolina can be reduced. It seems incredible that at this late day, no map of the United States can be constructed on which the States of the Atlantic seaboard and the States of the valley of the Ohio and Tennessee can be made to join. Yet such is the simple fact, and we hope to see the Legislature of Virginia take up Dr. Owen's base line as soon as it strikes the Sandy and carry it forward to the Chesapeake. It will pass through the towns of Covington, Lexington, Lovingston in the middle of the State, leave the University fifteen miles to the north and the Capitol as many to the south, cross the Chesapeake near Urbana and pass through Drummondtown into the Atlantic.

In connexion with the topography of the survey, we notice a theory of structure described by Mr. Lyon which we confess to reading with some surprise, and from which we must dissent until confirmed by further observation of an instrumental kind. Mr. Lyon describes the Greenup County region of the coal measures as a region of anticlinal waves, not ranging parallel with the central axis of the great coal field, like the faults and waves of Virginia and Pennsylvania, but occupying the subordinate positions of the axis lines of the ridges between the streams. If we understand his language, he makes this phenomenon

universal for Greenup County. But a glance at Mr. Mylotte's beautiful contour map of that county, shows these ridges to be numerous, unsymmetrical, and running off in various directions, which makes their anticlinal structure almost an impossibility, to say nothing of the well established fact that through all other regions of the coal measures as yet carefully studied, the very reverse holds true, the interstitial ridges being synclinal, exemplifying one of the most beautiful and stable laws of topography.

There is another point also which needs remark, not in a spirit of cavil nor even of confidence, for this at least involves an open question. But Mr. Lyon says, on page 308, vol. ii,—"along the entire line from Tygert's Creek there is manifestly a thinning of the sub-carboniferous limestone, millstone grit and other coal measures, *evidently marking the margin of the coal basin toward the north-west.* It is highly probable that many of the beds found in considerable force east of Little Sandy River will be found, on examination, to have entirely thinned out even before they reached that river, *other beds lying three or four hundred feet higher in* the series east of Little Sandy, *may* on White Oak Creek *be found resting on the millstone grit* which has thinned out to twelve feet and here rests on the knobstone; the sub-carboniferous limestone having entirely disappeared. It is highly probable that the line of the margin of the basin was frequently changed from the time of the deposition of the limestone to the end of the coal period. The coal basin being shallower near the margin, &c." The italics are our own, and show the point of discussion. We are startled by so bold a conjecture, that coal beds so high in the series, and persistent over such an enormous area as from Northern Pennsylvania to Western Kentucky, should in a few miles and in the very centre of this area fall down to and lie flat upon the conglomerate base of the coal measures. Lesquereux distinctly proves that coal 3 of Western Kentucky, is the equivalent of coal D of Western Pennsylvania, and that coal 4 of Western Kentucky, (coal E of Western Pennsylvania,) is the Pomeroy coal and also the Salem bed in the anthracite region and always maintains its position. Mr. Lyon's view we know is a common one; the geologists of Ohio have spoken years ago in very nearly the same terms of the Mahoning Valley coal measures. But we are convinced that this language says more than it means to say and instills a very important error into the minds of those who have not been taught by long topographical experience to distinguish always and involuntarily between the edge of a present coal area and the shore of the original coal depositing sea. These *may* in some few instances be coincident, as they certainly are in some of the ravine deposits of cannel coal beyond the Mississippi, and perhaps are so in some of the small basins near Chicago and Detroit, but no where else. The present long strait gophered edges of the two great coal areas of the east and west, facing each other across the Cincinnati anticlinal, bear no geographical relation whatever to the limits of that greater sea marsh in which the beds were deposited, but only to the directing lines of uplift which cross it in two directions at right angles to each other, elevating the whole series and

permitting the destruction and removal of all its middle portions from the surface of the present country of Cincinnati, Lexington, and Nashville. The western outcrop of which Mr. Lyon speaks is nowhere near the original shores of the marsh if the bold topography to the west can teach us anything, and therefore the phenomena which he describes, no doubt correctly, must be of those strictly local variations which occur all over the thickest and deepest parts of the coal area. We have here an analogy in fact to the discovery of fossils high on a mountain side, which were considered at first to prove the Noachian deluge, until they were discovered to be equally abundant and in the same condition at the end of the longest and deepest mines. There is nothing in geology more wonderful than that regular run of the coal beds at certain fixed elevations above the base of the series which has now been established almost beyond cavil as extending from the Delaware to the Mississippi. This reminds us that the most interesting part of the Kentucky Report is that of the Palæontology by Mr. Lesquereux, whose essay, vol. iii, pp. 501 and 556, in connexion with that of Mr. Cox, pp. 556 and 576, will have an abiding influence upon the geology of the future.

Mr. Lesquereux for the first time proves the identity of the coal beds over large intervals, not only of coal measures, but of coal denuded surfaces of Devonian and Silurian rocks, where he can have no assistance from the dynamic geologist, but must rely solely upon the nicety of his botanical classification. His success has been the reward of a lifetime of fundamental study and several years of special field-work in our coal mines, from the roofs of which he has obtained irrefragable proofs of the fact in fossil plants grouped so characteristically that it becomes a simple task of observation to determine bed from bed throughout the series. With a delicate apology in a short preface for seeming to anticipate in this Kentucky Report the publication of his first successes in this new field—successes obtained in Pennsylvania and reported some years ago to Prof. Rogers, to be embodied in the final report of that State—the amiable author opens at once upon his subject, vol. iii, p. 524, with a diagram occupying the two opposite pages of a sheet and entitled a "horizontal exposition of the different coal beds examined in the western coal field of Kentucky," the bottom line of which shows the different local names and sizes of the lowest coal bed, and the top line those of the twelfth coal bed; the intermediate beds coming in between. Then follows the Palæontology or botanical description of each bed. No. 1, the lowest or Bell, Cook, Casey, Old Distillery, Union, Hawesville, Breckenridge, Mulford Lower coal, for by all these names it is known in different places, lies in a geat bed of shales upon the conglomerate floor of the coal measures and is characterized by the prints of the bark of large trees, sigillaria, calamites, especially Lepedodendron, (L politum, Sigil. obovata, Cal. tuberculosus,) their fruit or cones, (lepidostrobi,) and many other fruits of the genera trigonocarpon, cardiocarpon, and carpolithes, looking like flattened almonds, peanuts, or peas, (although bearing no scientific resemblance to these modern fruit,) and ferns of the largest kind. The Sphenopteris is represented in this low coal by most of its species, which are scarcely

found above it, and some large pecopteris, especially Pecop. conchitica, belong to this bed alone. In this connexion Mr. Lesquereux warns us against mistaking the two small round kidney-shaped leaflets attached to the base of the large leaves of the Neuropteris hirsuta, so abundant in this bed and in fact throughout the coal measures, for the leaves of a separate plant, as the small hairs which cover them even when they grow to a large size and are called cyclopteris, are a sufficient key to their true place in coal botany. Mr. Lesquereux also here corrects the common error, consequent upon Mr. Logan's earliest researches in Wales, twenty-five years ago, and still maintaining its ground, that the Stigmaria ficoides are rootlets of a tree in the coal bed left in the white clay beneath it, by pointing out that the *roof shales* of bed No. 1 are full of them. The black shales of this bed are characterized by a small oval Lingula (umbonata,) the only shell at this geological level, and the first trace of marine conditions in the formation of the shales. The shell is found not only in Western Kentucky, but at Nelsonville, Ohio; Salines, Virginia; Rochester and Johnstown, Pennsylvania, and elsewhere.

We cannot, of course, pretend to follow Mr. Lesquereux through his careful analyses of the localities of the beds which he describes, and can only hint at their characteristics as he gives them in his valuable Report. Coal No. 2, he thinks the equivalent of Lesley's coal C in Pennsylvania, coal No. 3 is coal D of Lesley's Manual, and its shales are full of shells, large productus and spirifer. Coal No. 4 seems to be marked by Neuropteri's flexuosa, which is so abundant in the Pomeroy coal bed, of which this No. 4 is no doubt the western extension, as the Gate and Salem anthracite bed is its eastern. We leave our readers to study this fine fact upon the pages of Mr. Lesquereux's Report under his own guidance. If it be confirmed by the verdict of future students of American geology it will cover Mr. Lesquereux with honor how well deserved none will know who does not remember the chaos and darkness of the past, in which the pioneers of American science have lost and stumbled, hewn and built their way. Coal No. 5 is not well characterized, but No. 6 is recognised at once by its shales at localities as far distant as Hartford in Kentucky, and Athens in Ohio. No. 7 is known by its very small fish scales and teeth, sharp, straight and of a different form from those of the beds above. At Athens, Ohio, this important bed of fossils shows the same species and determines the scale of the measures, as it is about 100 feet below the Pittsburgh bed which is therefore in Western Kentucky. Coal No. 8 is thin and insignificant at that extreme western limit of its range as it is large and noble in the Somerset, Frostburg, Broad Top and anthracite basins of the east. Coal No. 9 is a good workable bed in Western Kentucky and is even larger than the one below it in Southern and Eastern Pennsylvania. It is therefore a more important bed than the Pittsburg bed, but never so recognised until Lesquereux's determinations of identity laid the basis of a new generalization of areas. The fossils of this bed are numerous and important; fern stems and bark of sigillaria; two characteristic shells, Avicula rectalateraria, and Productus muricatus; fish teeth, scales, and fins (in

abundance when the shells are not, and *vice versa*,) in company with a conical regularly ribbed print of the head plates of the cephalaspis, and long thin straight calamites which evidently grew in deep water. The same species of fish are found in coal No. 11, and the shells require nice scrutiny to distinguish them from shells of No. 11, so that in this instance we must fall back upon dynamic marks and notice that No. 11 is a double bed and its roof shales are finer and are covered with limestone, while No. 9 is based upon a very thick bed of fire clay. By means of this fire clay of the Western Kentucky coal, Mr. Lesquereux identified the small bed at the tunnel east of Greensburgh in Pennsylvania, and found above it the usual fish remains. Coal No. 10 "seems to be the most unreliable and inconsistent of all," "a wandering bed," high or low or absent or joined to No. 11, which is a peculiar fine well developed bed marked by fish teeth, &c. and different species of shells from those below, many pleurotomia and an avicula larger than A. rectalateraria. Its fossil plants are not so generally distributed, and the sigillaria are wanting; its shales are finer and blacker. Coal No. 12 is like No. 10, but well marked by large fish scales and large teeth (mostly double,) with two hooked points. Its coal is easily designated, being a rashy dirty compound of flattened stigmaria, calamites and some scarce sigillaria well preserved in their outlines, the roof shales covered with black band.

This terminates Mr. Lesquereux's Report for the season. He will report upon the great top rock or anvil rock, as it is called in the west, and the coal beds above that, which are of small economical importance however, next year we trust. Meantime he continues on in the remaining pages of his Report to state in admirable language his views of the formation of coal, bringing to bear upon this difficult and beautiful problem the treasures of observation and reflection of a lifetime gathered in both continents. He takes the phenomena of the Dismal Swamp of Virginia and North Carolina as his guide, and by the help of the soundings made in the peat bogs of the Old World shows how first sand bars shut out the ocean and make a continental fresh water marsh, half lake, over which grows a carpet of mosses and ferns, strong enough after a while to sustain trees, and throwing down a fine white mud: how this floating floor sags, breaks and finally sinks with its burden; how earthquakes can bring in the ocean, distribute the sand over the submerged bed, introduce salt water, shells and fish, shake the fruit from the trees and submerge, kill and finally overthrow the trees themselves; how the slow fall of the continent and the currents of the ocean remedy in time the evil, repair the sand barriers, restore the fresh lake; how a new vegetation begins again on the hummocks and spreads its floating fields again upon the waters; and how this alternation of events must have constructed the thousands of feet of our coal measures with their beds of coal and layers of different kinds of marine and lacustrine life, the marks of order and of time.

We leave with regret this fascinating book and its records of the worthy labors of worthy men, hoping to be called to renew our thanks and congratulations next spring over a fourth volume.

Abstract of Meteorological Observations for May, 1858; made in Philadelphia, Somerset, Bedford, and Huntingdon Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.

May, 1858.	Barometer. Mean.	Barometer. Mean daily range.	Thermometer. Mean.	Thermometer. Daily oscillation.	Thermometer. Mean daily range.	Relative humidity. 2 P. M.	Force of vapor. 2 P.M.	Rain.	Prevail'g winds.
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	
1	29·747	·228	70·0	18	7·3	54	·513	0·107	N E.
2	30·063	·316	56·0	11	14·0	64	·308		N E.
3	30·208	·145	54·7	19	4·7	37	·215		E.
4	30·039	·169	54·5	17	1·5	46	·255		E S E.
5	29·701	·338	59·3	13	4·8	78	·483	1·238	S E.
☽ 6	29·469	·232	65·7	14	6·3	67	·523		N E.
7	29·657	·189	61·3	6	5 0	83	·478	0·475	N.
8	29·849	·191	59·3	15	6·0	56	·397		N N E.
9	29·761	·088	58·5	19	2·2	59	·393		S E.
10	29·728	·046	59·2	8	4·3	72	·415	0·225	N E.
11	29·539	·189	61·7	13	3·2	89	·569	0·560	S E.
12	29 616	·194	57·0	10	4 7	49	·255		S W.
● 13	29·863	·248	65·0	22	8·0	26	·225		N W.
14	29·841	·074	56·2	9	8·8	64	·308	0·025	N E.
15	29·712	·129	65 3	23	11·5	64	·554	0 275	S S W.
16	29·901	·189	57·7	18	7·8	37	·215	0·155	(var.)
17	29·811	·183	57·7	11	1·3	60	·324	0·227	(var.)
18	29 740	·157	54 5	10	4·2	81	·378	0·040	N E.
☾ 19	29·833	·096	56·3	12	3·5	55	·296		N E.
20	29·662	·138	59·0	19	2·7	68	·437		(var.)
21	29·776	·081	58·0	17	1·7	26	·161		N W.
22	29 962	·186	59·2	19	1·8	43	·256		N W.
23	29·904	·131	66·0	16	6·8	36	·317	0·007	S W.
24	29·566	·338	71·3	17	5·3	77	·691	0·153	S W.
25	29·711	·144	59 3	17	12·0	76	·396	1·580	E.
26	29·664	·056	54·0	6	5·3	87	·391	0·049	(var.)
○ 27	29·764	·104	51·3	5	2·7	90	·355	0·100	(var.)
28	29·978	·213	57 7	17	6·3	39	·243		N E.
29	29·988	·044	52·7	12	5·0	58	·281	0·092	E N E.
30	29·966	·022	56·3	17	3·7	61	·340		(var.)
31	29·937	·029	63·8	23	7·5	43	·362		(var.)
Means	29·805	·158	59·3	15	5·5	59	·366	5·308	N 63¼ E.

SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.

May, 1858.	Bar. Mean.	Ther. Mean.	Relative humidity. 2 P. M.	Force of vapor. 2 P.M.	Rain.	Prevail'g winds
	Inch.	°	Per et.	Inch.	Inch.	
1	27·622	60·7	70	·495	0·400	W.
2	27·857	58·0	68	·437		E.
3	27·904	52·3	59	·295	0·334	S E.
4	27·705	50·0	63	·295	0·065	S S E.
5	27·469	52·3	93	·390	0·312	E.
☽ 6	27·373	54·7	94	·420		W.
7	27·616	56·3	71	·382		N.
8	27·694	62·7	53	·491		(var.)
9	27·620	63 0	67	·523	0·180	W.
10	27 578	51·3	89	·329	0·781	E.
11	27·262	57 0	83	·516	0·551	(var.)
12	27·543	47·0	71	·246	0 128	W.
● 13	27·801	55·0	48	·284		W.
14	27·657	58·3	83	·460	0·142	W.
15	27·631	62·3	75	·529	0·300	W.
16	27·722	53·3	71	·367	0·129	N.
17	27·542	63·0	61	·563	0·279	S W.
18	27·602	56·7	79	·502	0·281	W N W
☾ 19	27·629	51·3	78	·357	0·013	(var.)
20	27·573	50·0	68	·294	0·043	(var.)
21	27·728	46·7	64	·223		W.
22	27·830	49·7	53	·251		(var.)
23	27·636	64·0	58	·598	0·008	S.
24	27·456	66·0	67	·523	0·197	W.
25	27·420	60·0	89	·510	2·147	(var.)
26	27·399	56·7	94	·505	0 285	(var.)
○ 27	27·530	54·7	82	·393	0·245	W.
28	27·690	52·0	53	·254	0·018	E S E.
29	27·645	44·0	100	·288	0·571	S E.
30	27·628	60·7	72	·652		S E
31	27·568	66·7	63	·662	0·977	S S E.
Means	27·611	56·0	72	·388	8·386	

BEDFORD, Bedford Co. SAMUEL BROWN, Observer.

May, 1858.	Bar. Mean.	Ther. Mean.	Prevail'g winds.
	Inch.	°	
1	28·985	62·7	S W.
2			
3	29·361	59·0	S E.
4	29·158	56·7	S E.
5	28·872	56·3	S E.
☽ 6	28·720	57·7	N W.
7	28·943	61·0	N W.
8	29·063	64·7	(var.)
9			
10	28·984	51·7	N W.
11	28·660	58·0	S E.
12	28 896	52·3	N W.
● 13	29·194	59·7	N W.
14	29·068	62·0	W.
15			N W.
16–25			
26			S W.
○ 27	28·994	58·0	N W.
28	29·206	56·0	S E.
29	29·185	51·7	S E.
30			
31	29·017	65·3	S E.
Means			

HUNTINGDON, Huntingdon County. JACOB MILLER, Obsr.

May, 1858.	Bar. Mean.	Ther. Mean.	Rain.	Prevail'g winds.
	Inch.	°	Inch.	
1	29·269	65 0	0·267	N E.
2	29·580	57·7		N E.
3	29·609	57·7	0·008	(var.)
4	29·399	59·7	0·307	S.
5	29·094	55·7	0·710	E.
☽ 6	28·937	63·7	0·115	(var.)
7	29·177	63·3		N.
8	29 288	64·0		(var.)
9	29·159	68·7		S.
10	29·205	57·3	0·266	N.
11	28·817	58·7	1·778	E.
12	29 100	52·3		W.
● 13	29·376	60 0		(var.)
14	29·267	59·7	0·408	E.
15	29·204	68·7		(var,)
16	29·410	57·0		(var.)
17	29·189	59·3	0·858	(var.)
18	29·212	59·7		N.
☾ 19	29·282	57·3		S.
20	29·176	54·3	0·184	N W.
21	29·350	53·3		N.
22	29·470	56·0		N W.
23	26·278	62 7		S.
24	29·053	70·3	0·122	W.
25	29·092	60·7	1·396	S.
26	29 081	58·7	0 833	S.
○ 27	29·229	58·0	0·126	E.
28	29·435	57 7		S E.
29	29·400	51·0	0·612	S.
30	29·352	59·3		S.
31	29 271	64·0	0·772	S.
Means	29·509	59·7	8·762	

JOURNAL

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FOR THE

PROMOTION OF THE MECHANIC ARTS.

SEPTEMBER, 1858.

CIVIL ENGINEERING.

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*On the Resistance of Tubes to Collapse.** By WILLIAM FAIRBAIRN, Esq., C. E., F. R. S., &c., &c.

[Read before the British Association.—Section G.]

The following experiments were undertaken at the joint request of the Royal Society and the British Association for the Advancement of Science, and, in order to defray a part of the expense of conducting them upon a large scale, application was made to the former body for a grant of money, to provide the necessary apparatus and such other means as might be required to obtain correct and satisfactory results. The Royal Society unhesitatingly complied with this request, and cheerfully advanced the funds for that purpose.

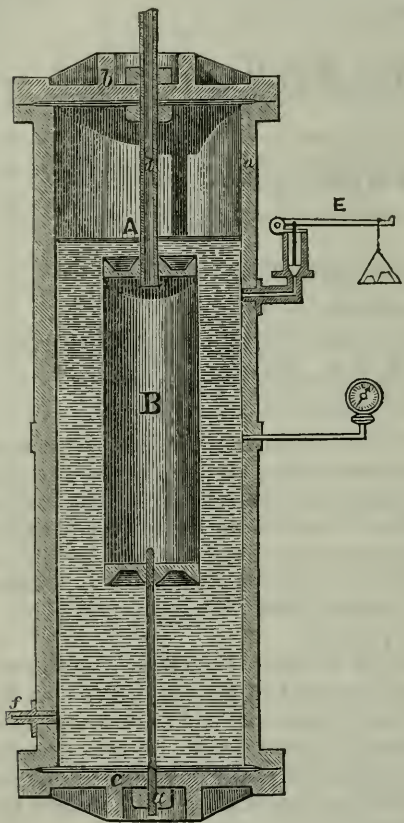
It must appear evident that, with an increase of the pressure of steam from 10 lbs. to 50 lbs., and in some cases to 100 lbs. and 150 lbs. on the square inch, that the utmost skill and attention should be bestowed upon the boiler, and the principle on which it is constructed. To remedy some defects in the proportions of the internal flues, and to supply a rule for calculating their strength in resisting an external pressure, were the objects of the following experiments.

To attain these objects in a satisfactory manner, it was necessary that the apparatus should be of such strength and size as would secure results commensurate with the importance of the inquiry. For this purpose a large cast iron cylinder was prepared, 8 feet in length, 28 inches in diameter, and 2 inches thick of metal, for the reception of the tubes

* From the London Artizan, October, 1857.

to be experimented upon. This cylinder was calculated to sustain a pressure of 800 lbs. to the square inch, without incurring the risk of fracture; and having enormously thick covers, it could be screwed down without risk of leakage of the highly compressed fluid within. In this large cylinder the tubes to be experimented upon were placed precisely in the form and position of the internal flues of a boiler, open at one end to the air, and attached to the covers, as shown in the following drawing of the apparatus. The pressure was obtained by means of a powerful force-pump, by which water was injected into the cylinder to the amount of the pressure required to collapse the tube.

Fig. 1 A* is a cylinder of cast iron, 8 feet long, and 28 inches in diameter, and 2 inches thick of metal. The top and bottom covers, *b* and *c*, were made of proportionate strength, and were screwed to the flanches all round, with 1 inch bolts, placed about 3 inches apart, in order to make the joints perfectly air and water tight. In the bottom cover, *c*, a hole 1¼ inch in diameter, was drilled, to receive the rod and screw-nut, *a*, which held the tube, B, to be experimented upon; and in the top cover, *b*, a hole 2½ inches in diameter was bored, to receive the pipe, *d*, inserted into the solid cast iron end of the tube, B. On the end of this pipe was a large nut, which screwed down upon an india rubber washer on the cover of the cylinder, so as to close the opening round the pipe, and make it water-tight. The object of this pipe was to allow the air to escape during the collapse, and to place the tube as nearly as possible under the same circumstances as the flue of a boiler. By this arrangement it will be seen that collapse could not take place without rupture at the ends, or a considerable amount of the tension in the direction of the length of the tube. This precaution was the more necessary, as fracture would ensue under circumstances similar to those which occur in case of collapse, which on almost every occasion is attended with rupture of the internal flues of the boiler.



* Wood cut taken from the London Civ. Eng. and Arch. Jour., November, 1857.

The greater part, or nearly the whole of the experiments, were conducted by means of the hydraulic pump forcing water through the copper pipe, *f*, about half an inch in diameter, and thus driving the air in a highly compressed state into the upper part of the cylinder; and in cases where the pressure exceeded 400 lbs. on the square inch, it was considered more secure to operate without the elastic force of air, and to effect rupture through the medium of water only; for this reason a cock was introduced to let out the air.

The pressure derived by pumping water into the cylinder was indicated by two gauges, one of Smith's and another of Shappin's construction. The first registered the pressure up to 150, and the other on 500 lbs. to the square inch. These two gauges (in order to secure correct results) were both of them tested by an accurately fitted safety-valve and lever and scale E, which being compared with the pointers or indicators at different degrees of pressure, afforded less chance of error in the event of any derangement or change in the working of the gauges.

These preparations having been made, and the indicator gauges carefully adjusted, the experiments proceeded in the order in which they are given in the following tables.

The first experiment was upon a tube composed of thin plates 6 inches diameter and 2 feet 5 inches long, between solid ends of cast iron, to which the tube was riveted and carefully brazed. This tube having been fixed to the cylinder covers, the pump was applied, and a force given to its exterior surface equivalent to its powers of resistance to collapse. During the experiments, the precaution of allowing the air to escape from the cylinder at high pressures was found absolutely necessary, as the tubes generally collapsed with an explosion of the compressed air, accompanied by a loud report as it made its escape through the pipe *b*. These explosions gave pretty correct indications of what takes place when the interior flues of boilers collapse; and in some of the experiments conducted with compressed air in the cylinder at high pressures, the only security afforded to the experimenters was the superior power of resistance in the outer shell of the cylinder in which the experiments were made.

It has long been a desideratum in the strength of boilers to determine some definite law by which the engineer could calculate the proportionate strength of internal flues. Ever since boilers became a necessary appendage to the steam engine, we have acted upon the principle that the internal cylindrical flues subjected to compression were absolutely stronger than the outer shell opposed to tension. These opinions have in reality had no foundation in practice, excepting from deductions drawn from occasional explosions and the failure of vessels under severe pressure. Hitherto there has been nothing definite, or any known principle by which we could calculate the diameter, thickness of plates, or length of flues corresponding with the strength of the boiler; and even in cases where explosions have taken place in collapse, we have too frequently mistaken the original cause from the *débris* surrounding the rupture, and the force which has torn to pieces the scattered remnants of the

outer shell. Numerous accidents of this kind have occurred, accompanied by serious loss of life; these have too frequently been caused by the collapse and the rupture of the internal flues, which, acting upon the interior of the boiler with an irresistible force, carries havoc and destruction before it. The relative position and comparative value of these resisting forces have never as yet been clearly ascertained, in so far as respects the cause of rupture, and the anomalous condition in which many of these constructions are affected, have greatly retarded the application of science to improvements in the manufacture. There appears in fact to be no rule in existence calculated to attain uniformity of strength in all the parts of a steam boiler, where some of the parts are exposed to internal and some others to external pressure.

The resistance of cylinders, spheres, &c., to internal pressure, have been ascertained from experimental data, such as the form and dimensions of the vessel united to the resisting powers of the material; but we have yet to learn what proportion cylindrical and elliptical tubes bear to each other in their resistance to external and internal pressure.

To supply this want, and to remedy certain anomalous forms and conditions in construction, it appeared desirable that the construction of vessels of such vast importance should not be left to chance, but that the principle of form, strength of material, &c., should be founded on direct experiment; that the law of resistance, under forms and conditions, should be ascertained; and the necessary formulæ of the practical mechanic and engineer have been attained by the results developed in the following experiments.

Experiments to ascertain the Resistance of 6-inch Tubes to Collapse.

In these experiments all the tubes were composed of plates of uniform thickness, and of the forms and lengths shown by the figures, in the column of remarks. The ends of the tubes, A, B, Ac, Ad, and Ae, were constructed with a pipe or tube for the escape of the air when collapse took place; but the tube Ba was unattached to the cylinder, and in lieu of being fastened at the ends, it had a stay rod, as shown in the longitudinal section, to prevent the ends approaching each other when the tube attained its maximum power of resistance, and collapse took place.

Table I. *Resistance of 6-inch Tubes.* — Table II. *Resistance of 4-inch Tubes.*

Marks.	No. of experiment.	Diamater of the tube.	Length of tube.	Thickness of plates in parts of an inch.	Pressure of collapse in lbs. per sq. in.	Marks.	No. of experiment.	Diameter of the tube.	Length of tube.	Thickness of plates in parts of an inch.	Pressure of collapse in lbs. per sq. inch.
		ins.	ft. ins.					ins.	ft. ins.		
A	1	6	2 6	·043	48	C	7	4	1 7	·043	170
B	2	6	2 5	·043	47	D	8	4	1 7	·043	137
Ac	3	6	4 11	·043	32	E	9	4	3 4	·043	65
Ad	4	6	2 6	·043	52	F	10	4	3 2	·043	65
Ae	5	6	2 6	·043	65	G	11	4	5 0	·043	43
Ba	6	6	2 6	·043	85	H	12	4	5 0	·043	140

The whole of the tubes, excepting Ba, which had an iron rod down its axis to prevent the ends approaching each other during the pressure of collapse, gave way with a loud report, forcing the air and water, in the shape of steam, through the pipe to a height of upwards of 40 feet. The tube Ba, having no outlet to the atmosphere, collapsed upon the air contained within it with a hollow but sufficiently audible noise to indicate when fracture ensued.

On consulting the above table, it would appear that the tubes of the same diameter, the same thickness of plate, vary in strength when of different lengths. The tubes of 2 feet 5 inches and 2 feet 6 inches long, and that of 4 feet 11 inches, or about double the length, are widely different in their powers of resistance. The resistance of the 5 feet tube to collapse being 32 lbs. on the square inch, whilst the mean of the 2 feet 6 inch tubes, only one-half the length, is = 59·4 lbs., or nearly double the pressure required to collapse the longer tube. In this computation it will be observed that the tubes which were screwed to the covers of the cylinder were to some extent in a state of tension, owing to the necessity of having to screw up the air-tube tight, in order to prevent leakage. This, with the weakness of the ends of the two first tubes, will account for the comparatively low pressure at which they collapsed. The other tubes, in experiments 5 and 6, had less tension upon them, owing to the collar round the air-pipe being more carefully fitted and adjusted to the collar of the tube. The excess of force required to collapse the tube in experiment 6, was owing to there being no tension whatever upon the sides of the tube. With these allowances, and taking the mean of the whole experiments, we arrive at the conclusion that the results approximate closely to the fact that the strength of 6 inch tubes are inversely as their lengths, as also those of other tubes exhibited in the succeeding experiments on the 4 inch and others of increased dimensions.

Fig. 1.

The tube H, experiment 12, in the above table, may be considered as three distinct tubes, as it was made with two perfectly rigid rings soldered to the outside of the tube. This was done to retain the tube in form, and prevent collapse at those points. The result of this simple contrivance was to increase the strength threefold; the strength of the 5 feet tube, without rings, was nearly the same as the length of each division of the tube with rings; and these experiments are decisive, in so far as regards the diminution of the resisting powers when the length is increased, and confirm those already recorded on the 6 inch tubes, which appear to follow the same law in relation to their powers of resistance to collapse.

Let us see how far this agrees with the 3 feet 2 inch and 3 feet 4 inch tubes, which collapsed with 65 lbs. per square inch; comparing them with the mean of tubes C, D, we have by the law just indicated, 19 : 153·5 : : 39 : 74·7, the pressure per square inch required by calcu-

lation to collapse similar tubes 3 feet 3 inches, or 39 inches long. The tubes E and F, however, gave way with a mean pressure of 65 lbs.; a circumstance which may be accounted for by the difference of form arising from the imperfect workmanship of the tubes.

Taking into account the effects of inaccuracies and imperfections of workmanship, we may reasonably conclude that tubes 4 inches in diameter are in almost every respect confirmatory of the fact, that they follow the same law in their resistance to external pressure as the 6 inch, namely, that the strength varies inversely as the length.

The next series of tubes submitted to experiment were those of 8 inch diameter, of the same thickness of plates (·043 inch) as the preceding. In these experiments it will be seen that the same law as respects the length pervades the whole of them in their resistance to strain from external pressure, and this is more strikingly exemplified in the 8 inch tubes than in either of the other two. These, like the last, had pipes attached to the upper end, and collapsed in the same way as the former, with loud reports.

TABLE III.*

Resistance of 8-inch Tubes.

Marks.	No. of experiment.	Diameter of tube.	Length of tube.	Thickness of plates in parts of an inch.	Pressure of collapse in lbs. per sq. inch.
		ins.	ft. ins.		
I	13	8	2 6	·043	39
K	14	8	3 3	·043	32
L	15	8	3 4	·043	31

TABLE IV.†

Resistance of 10-inch Tubes.

Marks.	No. of experiment.	Diameter of tube.	Length of tube.	Thickness of plates in parts of an inch.	Pressure of collapse in lbs. per sq. inch.
		ins.	ft. ins.		
M	16	10	4 2	·043	19
N	17	10	2 6	·043	33

* All the tubes collapsed with a loud report and hissing noise, which continued for some seconds after the collapse took place.

† Both tubes gave way as before with a loud report.

On comparing the above experiments with each other, it will be found that a very near approximation exists to the strengths being inversely as the lengths, and that the strength of a tube diminishes in a given ratio as the length is increased. Taking the strength of the first tube, 30 inches long, and calculating the force necessary to collapse 39 and 40 inch tubes, we have, by calculation, 30 lbs., the pressure required to produce collapse. Again, 29·25 lbs., the difference from the results obtained by the experiment being only 2 lbs. in the 39 inch, and 1·8 lbs. in the 40 inch tube.

The following experiments on 10 inch tubes are also remarkable for their consistency in regard to strength, and appear to be governed in resistance to external pressure by the same law as those previously experimented upon. In the 12 inch tubes also the same marked difference exists where the lengths are increased.

The whole of the previous experiments having indicated some slight

discrepancies, arising more probably from the defective state of the workmanship than from any other cause, made it desirable to repeat the experiments upon still larger tubes, and here the same principle of resistance is even more strongly marked than in either of the 4 inch or the 6 inch tubes. In the above experiments the ratio of strengths is correctly borne out in the 4 feet 2 inch tube, where the resistance is to a fraction, nevertheless, as the length, when compared with the 2 feet 6 inch tube, which, by calculation, gives 19·8 lbs., or within 0·8 of a lb., as that given by the experiment.

On comparing the pressures at which the 12 inch tubes in the next table collapsed, equally strong evidence is given confirmatory of the law by which tubes are compressed by external pressure.

TABLE V.*

Resistance of 12-inch Tubes.

Marks.	No. of experiment.	Diameter of tube.	Length of tube.	Thickness of plates in parts of an inch.	Pressure of collapse in lbs. per sq. inch.
		ins.	ft. ins.		
O	18	12·2	4 10½	·043	11·0
P	19	12·0	5 0	·043	12·5
Q	20	12·0	2 6	·043	22·0

TABLE VI.†

Resistance of Cylindrical and Elliptical Tubes.

Marks.	No. of experiment.	Diameter of tube.	Length of tube.	Thickness of plates in parts of an inch.	Pressure of collapse in lbs. per sq. in.
		ins.	ft. ins.		
R	21	14 × 10¼	5 0	·043	6·5
S	22	20¾ × 15½	5 1	·250	127·5
T	23	18¾	5 1	·250	420·0

* The collapse of all the tubes took place with the usual discharge and loud report that accompanied the smaller tubes.

† During the twenty-third experiment, on tube T, with ¼-inch plates, the joint of the top cover of the large cylinder gave way, at a pressure of 372 lbs. on the square inch. This caused the experiment to be discontinued until the joint was repaired, when it ultimately collapsed with a force of 420 lbs.

The resistance of the tube O, experiment 18, when compared with that of the 6 inch tubes, only one-half the length, required a pressure of less than one-fourth to cause collapse. This apparently low pressure appeared, at first sight, rather anomalous; but the accuracy of the experiment was confirmed by the next on tube P, ¼ inch longer, which yielded to a force 12·5 lbs. on the square inch. These facts are worthy of notice, as the experiment in this case was repeated in order to clear the subject of doubt, and establish data for the deduction of a formulæ by which to calculate the strength of cylindrical tubes; and the result is in accordance with another law, indicated by the experiments to which we shall have occasion subsequently to refer.

From the twentieth experiment, on tube Q, we derive additional confirmation of the law of the resistance of tubes, as regards their length; and from these results it is evident that a tube having the same strength of material, and being of the same diameter, will resist double the pressure to one of double the length; or, as we have already said, the collapsing pressure, other things being the same, varies inversely as the length.

(To be Continued.)

*On Submerging Telegraphic Cables.** By Mr. J. A. LONGRIDGE, M. Inst. C. E., and Mr. C. H. BROOKS.

The authors desired their attempt to investigate the laws to which the operation of submerging telegraphic cables were subject, to be considered only as a partial solution of an interesting and somewhat complicated problem. It was evident that much misapprehension existed on the subject, and it had been stated in the journals relating to the proceedings, at the Meeting of the British Association at Dublin, in the year 1857, that "it seemed to be universally admitted that it was mathematically impossible, unless the speed of the vessel from which the cable was payed out could be almost infinitely increased, to lay out a cable in deep waters, say two miles, or more, in such a way as not to require a length much greater than that of the actual distance, as from the inclined direction of the yet sinking part of the cable, the successive portions payed out, must, when they reach the bottom, arrange themselves in wavy folds, since the actual length is greater than the entire horizontal distance."

It was desirable to ascertain how far such a proposition was correct, and, if correct, what amount of "slack," or of surplus cable, should be provided to meet the waste, in varying depths of water.

The questions discussed in the paper, and of which the mathematical investigations were given in an appendix, were :—

1. The possibility of laying out a cable straight along the bottom, in deep water, free from the action of currents.
2. What degree of tension would be required in the process?
3. What would be the effect, as regarded strain, under the varying circumstances of the depth of water, of the specific gravity of the cable, and of the velocity of the paying-out vessel?
4. What would be the relative velocities of the cable and of the paying-out vessel requisite to reduce the strain or tension to any given amount, and what would be the consequent waste of cable?
5. The effect of currents, and the consequent waste of cable.
6. How far it would be necessary, or safe, to check the velocity of paying-out when passing currents, so as to avoid, as far as possible, waste of cable?
7. Would it be safe, and, if so, under what circumstances, to stop the paying-out, and to attempt to haul in the cable from great depths?
8. The effect of the pitching of the vessel in a heavy sea.
9. The principal desiderata in the paying-out apparatus.
10. The effect of floats or resisters.
11. The best means for saving the cable, in case of fracture.
12. The best mechanical construction of a submarine cable.

After investigating the laws of bodies, such as cables, sinking in a resisting medium, the paper proceeded to show the great waste of cable attendant upon paying-out free from tension at the ship. The form of the curve assumed by a descending cable was then examined, and the amount of tension at the paying-out vessel requisite to lay the cable

* From Newton's London Journal of Arts and Sciences, March, 1858.

without slack along the bottom, estimated under various conditions. The effect of the friction of the water in decreasing this tension, and the result, as regarded the tension, of increasing the velocity of the cable beyond that of the ship, were then pointed out. It was shown, that the decrease thus obtained was of small amount, unless the speed of the paying-out vessel was considerable, and that a decrease of tension should rather be sought in a diminution of the specific gravity of the cable. The tension at the ship, in 2000 fathoms water, was stated to be about 35 cwt. for a cable similar to the Atlantic cable; but with a cable of the specific gravity of 1·5 it would not exceed $7\frac{3}{4}$ cwt.

The effect of currents was then considered, and it was maintained that they did not bring any additional strain upon a cable, and involved only a small loss of length on first entering them. In a hypothetical case of a current extending to a depth of 200 fathoms, and running with a velocity of $1\frac{1}{2}$ foot per second, at right angles to the ship's course, it was calculated that the extra length of cable due to the deflecting action of the current would not exceed 28 fathoms, the velocity of the ship being 6 feet per second.

The effect of stopping the paying-out was next treated of, and it was shown that it would be to bring a very heavy catenarian strain on the cable, depending upon the depth of water, and the velocity of the paying-out vessel. The amount of this strain for the Atlantic cable in a depth of 2000 fathoms, and at a velocity of the paying-out vessel of 6 feet per second, was calculated at above seven tons.

The question of hauling in the cable was then adverted to, and the conditions under which it might be safely attempted were pointed out.

After discussing briefly the effect of the pitching of the vessel upon the strain of the cable, the paying-out apparatus was referred to; and the importance of reducing its inertia, and of so constructing the breaks that they should act freely, was maintained. Two plans were then mentioned for saving the end of the cable in case of fracture, and tables were given, showing the velocity and direction taken by the end of the cable under such circumstances.

The authors then proceeded to offer some remarks upon the mechanical structure of the cable, and strongly advocated a light cable. The distinguishing feature of this system of construction was, that the whole of the metallic portion was placed in the centre, and was surrounded by the insulating material; whereas, in the Atlantic cable, there was an outer sheathing of wire rope twisted spirally round the insulating medium. It was shown that whilst the absolute weights of the two cables were as $21\frac{1}{2}$ to 10, their relative strengths were as 11 to 25, so that the light cable, weighing scarcely one-half of the heavy one, had nearly two and a half times its relative strength.

The effect of compression and tension on the two constructions was then referred to, and it was maintained that, in this respect also, the light cable possessed advantages over the other.

In conclusion, the authors, while disclaiming any intention to find fault, expressed their strong conviction that, though the Atlantic cable was a step in the right direction, as compared with the heavier cables

of former days, it yet fell far short, in mechanical structure and condition, of the light system recommended by Mr. Allan and others.

The practicability of safely submerging the present Atlantic cable was not denied, but it was strongly urged that, with a cable of its specific gravity, success would be greatly dependent upon the nature of the paying-out apparatus, and the sedulous attention of those in charge of the breaks.

Proc. Insti. Civ. Eng., Feb, 16th. 1858.

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*On the Practical Operations connected with Paying-out and Repairing Submarine Telegraph Cables.** By Mr. F. C. Webb, Assoc. Inst., C. E.

The author explained, in the first place, that through the hesitation of those who had charge of the works, in publishing facts which might affect the commercial value of such enterprises, he was unable to supply complete details of the operations performed in submerging those cables upon which he had not been practically employed.

He then enumerated and described, in general terms, the operations connected with the cables laid down from Dover to Calais, in 1850 and 1851; that from Holyhead to Howth; that between Port Patrick and Donaghdee; and the cable to Ostend; relating at the same time the causes of the various failures to which some of them had been subject.

He next pointed out the route proposed for the Hague Cables, describing their construction, and the reasons which induced the engineer, Mr. Edwin Clark, to determine on adopting the small single cable system. After alluding to the advantages and disadvantages of the simple over the compound cable, he expressed the opinion that this system was undoubtedly correct, but that the cables were made too light for this particular locality, and were not laid sufficiently far apart from each other.

The arrangement adopted for testing the cable during the process of construction was then explained, and the serious error of submerging cables in their final position, without having previously tested their perfection by suitable means, was noticed. The Atlantic cable was not tested under water, from the fear of its strength being impaired by the formation of rust. This might have been avoided by galvanizing, which was shown not to have the effect of weakening wire to the extent generally supposed.

The arrangements for coiling the cable on board the "*Monarch*" steamer, for the Hague route, were then detailed, and some remarks were made on the conditions of a coiled rope, showing the necessity of carrying the cable from the hold of the ship, when elliptical coils were used, over shears fixed above the hatchways, to give the rope sufficient height to enable the twist, which the cable had received in coiling, to be neutralized; and also the advantage of circular over elliptical coils, and the difference between a rope wound on a drum, and that coiled up in itself. The manner of buoying, or ranging off the course, from England to Holland, the progress of the "*Monarch*," and the manner of testing the cable during the period of paying out, were then narrated.

* From Newton's London Journal of Arts and Sciences, April, 1858.

The act of speaking through a cable was not considered a sufficient test of its perfection. The case of the Atlantic cable was instanced; where, from Professor Morse's report, the author concluded that a serious fault had passed unnoticed.

The paper then proceeded to remark upon the steering of vessels across tideways for the purpose of paying out cables, as opposed to the manner of steering for an ordinary passage; showing the curve that would be taken by a cable, if an allowance was not made for the effect of tides. A practical method was given, by which the required rate and direction of the vessel across a tide could be quickly ascertained.

The operation of laying down the thick shore ends, on the English and Dutch coasts, was then detailed, as well as those of the Irish cables. The shore ends, similar to those of the Atlantic cable, tapered off from large-sized wire to the same size as the cable.

In making arrangements for paying out a cable, the first point for consideration was the selection of a ship. The paper discussed the relative merits of screw and paddle-wheel steamers; giving the preference to the latter, except in the case of a screw where the engines were placed well aft, thus giving plenty of accommodation for stowing the cable. The next point for consideration was the disposition of the cable in the most convenient form for paying out freely. Accidents, arising from improper coiling, were quoted; and the necessity of careful coiling, was dwelt upon. The great advantages of Mr. Newall's cone and rings for paying out were described.

The brake was the next consideration. The drum brake, of which an illustration was given, was that used on all cables hitherto successfully laid. Mr. C. Bright's brake was also mentioned, and its advantages and disadvantages were pointed out. Its chief disadvantages appeared to be its weight, or *vis inertiæ*, and the time required to release the pressure on the brake-pulley. The importance of brakes in deep water operations to regulate the speed at which the cable was being paid out, as compared with the rate of the ship on her course, and the necessity of providing for irregular strains, was adverted to. Mechanical contrivances to supersede manipulation in the quick release of the brake were disapproved.

The curve taken by the cable in descending great depths was discussed, showing it to be concave towards the ship, in every part, but approaching a straight line as it neared the ground. The angle which the cable made with the horizon, when being paid out, was about 9° or 10°, while the waste varied from 30 ℔ cent. to 50 ℔ cent.

The necessity of supplying buoys with suitable moorings, to provide against accidents, was next urged. Several cases were cited where the use of buoys would have prevented the loss of cables, and the consequent waste of property. The buoyage arrangements of the Atlantic cable were described.

The difficulty and danger of stopping the egress of the cable during the process of paying out were urged, and the means of providing against such accidents were represented.

The tendency of a cable astern a ship to swing it round, in opposition to the action of the helm, with its effect in two or three instances,

together with the means of avoiding such an event, by placing the free point of the cable as near the centre of the ship as practicable, were discussed.

Whilst proper allowance was given to the importance of possessing perfect machinery, the author was of opinion, that sufficient value was not placed upon the necessity of having an organized and efficient staff. It was indispensable that those having the management of submerging cables should possess a nautical knowledge. The difficulty that would have been experienced in the late attempt to lay down the Atlantic cable, when the end had to be passed from the "*Niagara*" to the "*Agamemnon*," was explained.

The paper then proceeded to describe various operations connected with the repairs of cables; showing, first, the means to be taken to detect the position and nature of the fault, and then those adopted to make the cable good,—several operations of this nature, executed by the author in the North Sea, were described. Cables which had been broken by anchors, &c., were mended at points varying from two to fifty miles from land; at one time in a tug, at another time in a Dutch fishing-boat, and lastly, in the "*Monarch*" steamer, whose fittings for the purpose of general repairs were detailed. The operations of grappling, under-running, buoying, and picking up, were minutely described. In one instance, 120 miles of cable were picked up, repaired on land, and re-laid.

The paper concluded by pointing out that by such means cables could be regularly repaired, and that submarine wires, in shallow seas, became a much less precarious property than they were at first supposed to be.

Proc. Insti. Civ. Eng., Feb. 23d, 1858.

Discussion of the Papers on Submerging Telegraphic Cables. By Messrs. J. A. Longridge and C. H. Brooks, and *on Paying-out and Repairing Telegraph Cables.** By Mr. F. C. Webb.

The discussion was commenced by remarks upon some of the deductions in the two papers, which, it was argued, could not be accepted implicitly. It was contended, that there was not any proof of the cable arranging itself in folds or coils at the bottom of the sea, and that the "waste" or surplus length of cable laid down, could not be as much as 30 to 50 ℔ cent. more than the actual distance traversed. There was not sufficient foundation for these statements, and therefore they were considered to be erroneous. By a model exhibited, it was shown that a small chain, when uncoiled from a roller, round which it was wound, was delivered in a straight line as the roller traveled along upon the upper plane of the model. Hence it was argued that, allowing for the greater buoyancy, or the reduction of specific gravity, by immersion in water, a cable could be laid at the bottom of the sea, in the track of the ship, exactly as it left the coil in the hold, without any loss of length. The concavity of the line of cable from the ship, as

* From Newton's London Journal of Arts and Sciences, April, 1858.

exhibited in the diagrams, was contended to be imaginary, and the wavy folds, also depicted, were doubted.

Constructing cables with an external iron wire covering, laid spirally, and a gutta percha wire, was objected to, because the covering would yield when the strain came upon it; whilst the gutta percha core, containing the conducting wire, being straight, would be liable to fracture. Thus, the insulating medium being cracked, the cable would become useless.

It was explained, that the conclusions given in the first paper were based upon the mathematical reasoning given in the Appendix. The methods proposed for catching the end of the cable, in case of fracture, were only intended as suggestions, and were not insisted upon; but where so much capital was at stake, and when a single accident might risk the whole venture, any means of catching the end of the cable deserved attention.

As to the processes of paying out and of repairing cables, the former was comparatively simple and easy, whilst the latter involved a series of different operations, constantly changing in character. It was impossible to treat both questions fully, and therefore the greater prominence was given to the former, as being more generally interesting.

It was explained, that it would be desirable to have the external wires of a cable laid straight, if it were practicable; but it was not so, and therefore, arrangements were made for giving to the internal conducting wire, with its gutta percha covering, a spiral form, which conferred on it a greater degree of elasticity than was possessed by the outer wires, which would, therefore, be ruptured before the inside wire was injured. When the Dover and Calais cable was torn asunder by a ship's anchor, in January, 1857, it was found that the inside wires were much longer than those of the external covering, and that the gutta percha was uninjured, except at the point of rupture.

It was also stated, that in every instance in which the Atlantic cable had been tested for strength, the iron outer wires were broken before the copper inner wires yielded to an extent to impair materially the efficiency of the conductor.

It was admitted, that advantage would result from the use of any appliance, by which the egress of the cable could be retarded, so as to allow of heavier and better protected cables being laid in deep water. There were, however, almost insuperable practical difficulties attendant upon the application of any controlling power to a cable of small section, as there were objections to the use of heavy cables of large section in the great depths of the Atlantic. For these reasons, resisters, such as buoys, or discs of certain area, had been proposed; and Colonel Beaufoy's experiments showed that a retarding strain could be put upon the cable when sinking, but if it became requisite to draw the cable up again, the extra strain would act very prejudicially. There were, however, mechanical means of detaching these resisting floats when a contrary strain occurred. It was not considered to be of vital importance, even with a light cable, to compensate for the pitching of the ship, where it was possible to use light machinery for paying out. This

should be a primary consideration, as light cables were indispensable for deep water; but up to the present time, no light cable had been offered which met all the requirements so well as that made for the Atlantic telegraph.

The conducting and insulating powers of cables of various forms must be carefully considered, and in those respects, it was contended that the light cable prominently alluded to in the first paper was very deficient. The researches and lucid explanations of Dr. Faraday on this part of the subject were noticed, and it was shown that, instead of having a strong conducting iron wire in the centre, it was better to have a smaller wire of copper, the conducting power of that metal, according to Becquerel, being 100, whereas that of iron was only 15, or six times less than copper. At the same time, the difficulty of obtaining perfect insulation, and the chances of leakage, were proportionately increased by having a greater extent of surface to protect.

With regard to a remark in Mr. Webb's paper, that the Atlantic cable was not tested under water, it was stated that the core was regularly tested from the beginning with a battery series of five hundred cells and the most sensitive instruments, after having remained under water for some days. The core was then sent to the works upon drums, so protected that it could not possibly be injured, and was immediately covered with a serving of hemp prior to receiving the outer strands. It was true, Professor Morse had correctly stated that as they got further from the shore in the Atlantic undertaking, the signals were weaker; but a very low battery power was purposely employed, so as to render apparent at once, by the effect on the instruments, any falling off in the continuity or insulation. As new lengths of cable were added, from time to time, to the circuit, there was, of course, some variation of signals, and the adjustment of the instruments was sometimes interfered with by the motion of the ship; but there was nothing uncommon in the occurrence, and the supposition that a fault had passed unnoticed was altogether groundless.

It was remarked, that although light cables were preferable for great depths, yet in shallow waters heavy cables were necessary, as being less liable to injury; and it was asserted that, in this respect, the light Hague cables would always be a source of considerable annual expense, as compared with the heavy Dover and Calais and Dover and Ostend cables, in which there had only been one instance of failure in five years.

In the first experimental cable from Dover to Calais, consisting of one No. 14 copper wire, insulated with gutta percha, both laid straight, it was found that, when the strain was removed, the gutta percha had a tendency to return to its original length, whilst the wire was drawn down nearly to No. 16 gauge. The wire forced its way through the gutta percha in several places, so that the insulation was destroyed. It was then suggested by Mr. Wollaston, that in a cable containing several wires, the core, including the conducting wire or wires, and the gutta percha, should be twisted spirally, like the outer covering. This plan was now universally adopted.

In reference to the durability of submarine cables, it was stated that the cable belonging to the British Telegraph Company was laid down about four years ago, and had remained perfect ever since. The only cost to the company for maintenance or repairs was a small gratuity to the coast-guard on each side of the channel, who were asked to write whenever either end of the cable was exposed on the beach. It was remarked, that simple cables, with a single conductor, had cost large sums of money for maintenance and repairs, while under the compound system, with two exceptions, but little or no expense had been incurred. This should be borne in mind in designing submarine cables in future. The plan of paying out a cable from the stern of the vessel, was objectionable. The preferable part of the vessel for the cable to leave the ship, seemed to be the centre, or the centre of gravity, by which all waste from the pitching or rolling of the vessel would be avoided. A conical hole, with the apex of the cone tending upwards, should be made for the purpose, and then the cable would not be chafed by rubbing on its departure on any part of the vessel. The almost certainty of a storm occurring during the operation of laying down the Atlantic cable, rendered it the more desirable that every precaution should be taken which could be devised to insure success. And if it were not possible to alter a vessel so as to pay out at the centre, then a ship should be specially built for the purpose.

The small number of words at present capable of being sent through the Atlantic cable,—the number being, according to the company's report, only four per minute,—had induced Mr. E. Highton to devise a code system for use in long lengths of telegraphs. He exhibited an instrument which was capable of transmitting through a wire eight hundred million times two million preconcerted messages, the maximum period for the occupation of the wire not exceeding ten or twelve seconds, if sent at the rate at which the Queen's speech was transmitted from London. He also explained one of three instruments used in the transmission of the American President's last message, which consisted of upwards of sixteen thousand words, at the rate of three thousand five hundred words an hour. The desirableness of magnifying the effects of electricity arriving at a distant station, especially in the case of leaky wires, had led to the invention of an instrument for the purpose.

It had been found that the light and heat of the sun, the mycellium of a fungus, and other substances and conditions, had the power of rendering gutta percha unfit for the insulation required for the transmission of messages by means of electricity. Several specimens of gutta percha in a decayed state were exhibited; and also a piece of copper wire, 5 feet in length, covered with gutta percha, which was strained until it broke; when the gutta percha, owing to its partial elasticity, contracted, and left 7 inches of copper wire uncovered. A newly made tube of gutta percha, under a strain of 276 lbs., stretched from 14 inches to 24 inches before breaking; but a similar tube, which had been exposed for about five years to the atmosphere, light, and heat of the sun, was so brittle, as to be easily broken by the hand.

With regard to the failures of several light cables, including the first

from Dover to Calais, the first from Holyhead to Dublin, and one from Portpatrick to Donaghadee, it was shown that there was not the slightest identity in the principles of their construction, and that they were early experiments in submarine telegraphy. And as 50 ℔ cent. of all the submarine cables hitherto attempted to be laid had been failures, no argument against light cables, as opposed to heavy cables, could be based on such premises.

It was regretted, that so little attention appeared to have been given to the paying out machinery, which, it was contended, should be designed with a view to keep a retarding force upon the cable equal to the difference in speed between the vessel and the cable. But as the speed of the former varied, owing to the wind, currents, and other causes, the measure of this difference in the paying out machinery should be by means of a spring, or a pulley, carrying compensating weights, which, by its rise and fall, would indicate the increased or lessened speed at which the vessel was going, and to regulate the strain upon the cable, so as to make it as uniform as possible.

It was stated that, in paying out the Mediterranean cable from Cagliari to Bona, Mr. Werner Siemens had employed an apparatus which not only regulated the strain upon the cable, by the deflection of a weighted lever, resting upon the cable, between the break and the stern pulley, but also overcame, to a great extent, the evil effects of the pitching of the vessel. When the vessel pitched, the weight rose, and allowed more cable to run out, so that the pullies of the break traveled at a uniform velocity.

With reference to the best form for a submarine cable, it had been proved that, when great depths had to be traversed, one of light specific gravity was to be preferred. The conductor, which constituted the weight to be carried, should therefore be as light as possible; and to insure its continuity, it should be relieved from strain by the external coating. The conductor, when of copper, had a specific gravity of 11, the gutta percha insulator was nearly equal in weight to sea water, and the iron external covering had a specific gravity of 7. Probably, aluminium might be substituted for copper in deep sea cables, with advantage, as it was nearly equal in conducting power, and was only one-third of the weight. The outer covering should be of hard material, so as to resist the longitudinal strain during the process of submerging, but it should add as little as possible to the weight. It was considered that no material fulfilled these conditions so well as soft steel. A thin steel wire coating would produce a cable of the least weight, and be capable of suspension to the greatest depth: nor should it be more expensive than iron, if the power of suspension was taken as the basis of the calculation.

It was stated that, before the present Atlantic cable was decided upon, from twenty to thirty specimens of different forms of light cables had been tested for strength, by means of an hydraulic machine. The form adopted was the strongest with one exception. A cable, with a steel wire coating, was found to be superior in that respect; but in addition to its great cost, it was ascertained that it would have been

impossible to obtain the necessary quantity of wire in less than from one to two years.

With regard to the failures in the attempts to lay a heavy cable between Sardinia and Africa, in the years 1855 and 1856, it was stated, that it was due, in both instances, to want of length. Proof had, however, been obtained, that it was possible to submerge a heavy cable successfully in a depth of 1640 fathoms. It was all important, in enterprises of this kind, to ascertain, with accuracy, the relative speed of the ship and of the paying-out of the cable. In the cases last alluded to, the log was hove every quarter of an hour; and the length of cable payed out was ascertained from the number of revolutions of the drum. By these means the brakesmen regulated the tension. It was believed, that the greatest speed practicable, in ordinary cases, would be found to be from five to six knots per hour. Floats or resisters had not been used in these instances, where a depth, as previously stated, of 1640 fathoms had been successfully attained; but it was thought that it would be prudent, in an operation like the laying of the Atlantic cable, where a distance of upwards of 1600 miles had to be traversed, to employ a good system of buoys at every 300 or 400 miles.

The vertical velocity of the Atlantic cable would be about 3 feet per second; and assuming it to weigh in water 15 cwt. per mile, and to break with a strain of $4\frac{1}{4}$ tons, then there ought only to be a strain of $1\frac{1}{2}$ ton, when paying out in a depth of 2 miles. Nor should it be exposed to any much greater strain, provided the brake apparatus was properly contrived, and efficiently worked.

In illustration of the advantages of paying out the cable from the centre of oscillation of a vessel, in place of from the stern, it was asserted that the stern of the "*Niagara*" in passing over the crest of a wave 20 feet in height, and from 600 to 700 feet in length, would rise or vibrate 75 feet, causing violent and sudden tension of the cable, whilst the centre would only rise 20 feet.

To this it was replied, that the rise and fall of the stern, above or below the horizontal line of such vessels as the "*Persia*" or the "*Niagara*," in crossing the Atlantic, never reached 10 feet.

As a practical illustration of the facility with which light cables could be laid, it was mentioned that, although the submarine telegraph between Varna and the Crimea was submerged under considerable difficulties, and during a storm, yet the actual length payed out was only $3\frac{3}{4}$ miles in excess of the distance between those places, which was nearly 350 miles. The depth of the Black Sea where this cable was laid was about 70 fathoms. The cable consisted, throughout the greater portion of its length, simply of No. 16 copper wire, served with gutta percha, and wholly unprotected. The shore ends had an iron sheathing, extending to a distance of 10 miles from Varna, and of 6 miles from the Crimea. Its insulation was perfect; and it remained uninjured for twelve months, during the time of the Russian war, notwithstanding the many violent storms to which it was exposed in the Black Sea, until during a storm of more than usual severity, it was broken on the 5th December, 1855.

In the commencement of the discussion, it had been said that it was impossible there could be any "waste;" and this position had been illustrated by a model, in which a chain was suspended and paid out from a cylinder, showing exact agreement between the length paid out and the distance traversed. Had, however, the chain been coiled upon a larger or smaller part of this cylinder, either the operation would have been brought to a stand-still, or more cable would have been paid out than was due to the distance traversed by the cylinder. It had also been said that, whether the cable was paid out in air or in water, the circumstances would not be modified to any material extent. Now a bar of iron, one inch in diameter and two miles in length, would weigh 13 tons, and if this was suspended vertically in the water, the resistance, at $5\frac{1}{2}$ miles per hour, would amount to 50 tons. When the vessel got into motion, the bar would immediately assume an inclined position, and adjust itself to the strain, and probably in the case cited, the inclination would be 4 to 1. If, however, the specific gravity was reduced, and the inclination was nearer to the horizontal, then the strain would be reduced. The Atlantic cable being about $\frac{5}{8}$ths of an inch in diameter, the resistance at the depth stated would be about 30 tons; and as the breaking weight was about 4 tons, it was clear that that cable should be inclined so as to reduce the strain to 2 tons. Therefore, as 2 tons was to 30 tons, so was the square of the sine of the angle to the radius; from which it resulted, that the least length at which the cable should be paid out was from 8 to 9 miles from the vessel to where it touched the bottom of the ocean. Whenever the speed of the vessel was reduced, the cable would have a tendency to assume a vertical position; and this would bring into play the direct weight of the cable, more or less, in addition to the above resistance, so that the strain would be increased. The result of these considerations led to the belief, that a much lighter cable than that proposed would be found most advantageous for long distances at great depths.

In reply to the observations of preceding speakers, it was stated that the results arrived at, and contained in the first paper submitted to the Institution, were not mere opinions, but were deductions from strict mathematical reasoning, the whole of which was given in the Appendix.

The different problems which presented themselves for consideration, and their modes of solution, were then generally explained. Some misapprehension seemed to exist with reference to the subject of resisters or floats. If of less specific gravity than the cable, their effect was to decrease the tension, by imparting buoyancy to the cable. The other effect, as resisters, would be very small, unless the cable was running out with great waste. They ought not to be attached in a parachute form, but should be fixed on to the cable itself; and probably a spherical form would be most convenient. Attention was then drawn to the curious result arrived at with respect to currents, and it was observed that the waste of cable due to their action was very small, and that they caused no extra tension. The inutility of seeking a reduction of tension, by letting the cable run out with slack, was pointed out and illustrated by diagrams.

The effect of the pitching of the vessel was adverted to, and it was shown that very heavy and dangerous strains might be brought upon the Atlantic cable from this cause; and that such strains could scarcely be avoided when using the ponderous paying-out apparatus presumed to be required for so heavy a cable. The gearing together of the sheaves was considered to be dangerous; and self-acting brakes, however perfect, were decidedly inferior to the manipulation of vigilant and intelligent men in an operation of this nature, where the conditions were constantly varying.

The statistics of the submarine cables, hitherto essayed, showed that, out of forty-three attempted to be laid, six only had failed during the process of laying, four subsequently, and one of the Hague cables was at present under repair,—leaving thirty-two in perfect working order. These facts completely disposed of the assertion, that 20 ℔ cent. had either failed in being submerged, or immediately afterwards. Of the ten total failures, three were strictly light cables, with no outer wires, being the only uncovered cables tried; and the two failures of heavy cables, after submersion, arose from their being too light. Several cables had, it was true, been broken by anchors, in consequence of the absence of sufficient iron protecting wires, but these had been immediately repaired, and were now in regular work. Of the six failures in submerging, two occurred with the Mediterranean cables, in the years 1855 and 1856, when 256 miles were lost, of the value of about £70,000; a third with the Newfoundland cable; a fourth with a light cable from Portpatrick to Donaghadee; a fifth with a heavy cable on the same route; and, lastly, the Atlantic cable. Of these, the Newfoundland and the heavy Fortpatrick and Donaghadee cables, had been recovered; and during the present summer, the raising of the Mediterranean cable was to be attempted.

In reference to the mechanical and electrical questions involved in the consideration of this subject, it was regretted that the paper by Messrs. Longridge and Brooks had not been discussed in proportion to its merits. If mathematical investigation could ever be relied on in practice, confirmed, as it was in this case, by geometrical analysis and by actual experience, that paper ought to be of great use in guiding those who had the superintendence of the paying out of cables in deep water. It had been shown that, to lay a cable straight, a strain must be exerted equal to what had been termed the minimum tension, or the weight of a piece of cable equal in length to the depth of the sea where the cable was being paid out. That result was contrary to what had been generally supposed to obtain; but there was no practical proof that it was incorrect. Finally, that paper showed, that a decrease in the specific gravity of the cable was the real remedy for great tension. No doubt, if a cable could be decreased in specific gravity, without diminishing its strength, or in a greater proportion than its strength was decreased, all other necessary conditions being complied with, the difference between the breaking strain, and the strain required to support a given length of the rope in water, would be augmented. This had been aimed at in the Atlantic cable, by reducing the weight of the

outer covering of iron wires, and proportionately enlarging the gutta percha; and the opinion was expressed, that no plan had hitherto been proposed, by which this difference could be materially extended, that did not possess other serious disadvantages.

The system of paying out cables from the centre of oscillation had been frequently suggested; and although it presented another advantage not previously mentioned in the discussion—that of facilitating the steering—it had not been deemed expedient to adopt it. The cable would form a sharper angle round the bottom of the vessel than it would over the stern, so that the crush on the cable, tending to flatten it, and the friction would be increased; and should there be a broken wire, which, with the greatest care, would sometimes occur, there would be no means of freeing it, as when paying out over the stern. But perhaps the most serious disadvantage was, that there would be no means of ascertaining what the sailors termed the "grow" of the cable, or the horizontal and vertical directions it assumed after leaving the ship; by which, in the one case, valuable information was obtained as to whether the vessel or the cable was being acted upon by currents, or by tides; and in the other, a rough and ready means of approximating to the strain on the cable. The cutting for buoying, and the change from one hold to another, and so altering the "lead" on to the brake, would also be attended with certain practical inconvenience.

In conclusion, the hope was expressed that the Atlantic undertaking might be carried to a successful issue during the present year; for it was to be feared that another failure would destroy public confidence in such enterprises, and so retard the much desired extension of telegraphic communications.

Proc. Ins. Civ. Engineers, March 2d–9th–16th–23d, 1858.

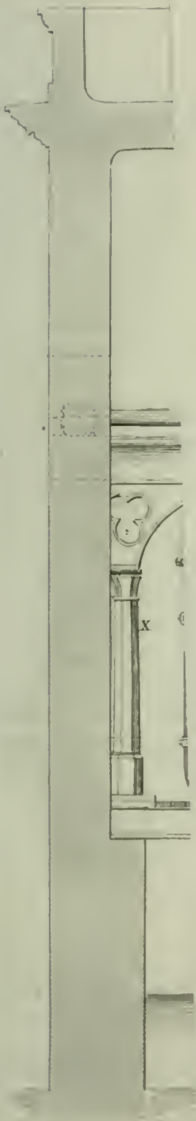
For the Journal of the Franklin Institute.

Jonval Turbines of three hundred horse Power, erected at the New Harmony Mills, Cohoes, N. Y.

The accompanying plate represents two Jonval Turbines, recently erected by Mr. Emile Geyelin, of this city, at the New Harmony Mills, Cohoes, N. Y., Alfred Wild, Esq., agent.

The wheels, reservoirs, and the girders supporting the reservoirs, together with the columns, entablatures, and bridges for carrying the bearings of the shafting, are altogether of iron; thus making the wheel building, and the whole arrangement of the motors, with the adjacent parts for conveying motion to the machinery in the mill, completely fireproof.

Plate II. presents so well the arrangement, that a description is hardly necessary; but for the benefit of those who are unacquainted with this species of hydraulic motor, the following notice of the letters marked on the several parts, will indicate the names and the uses of the parts.

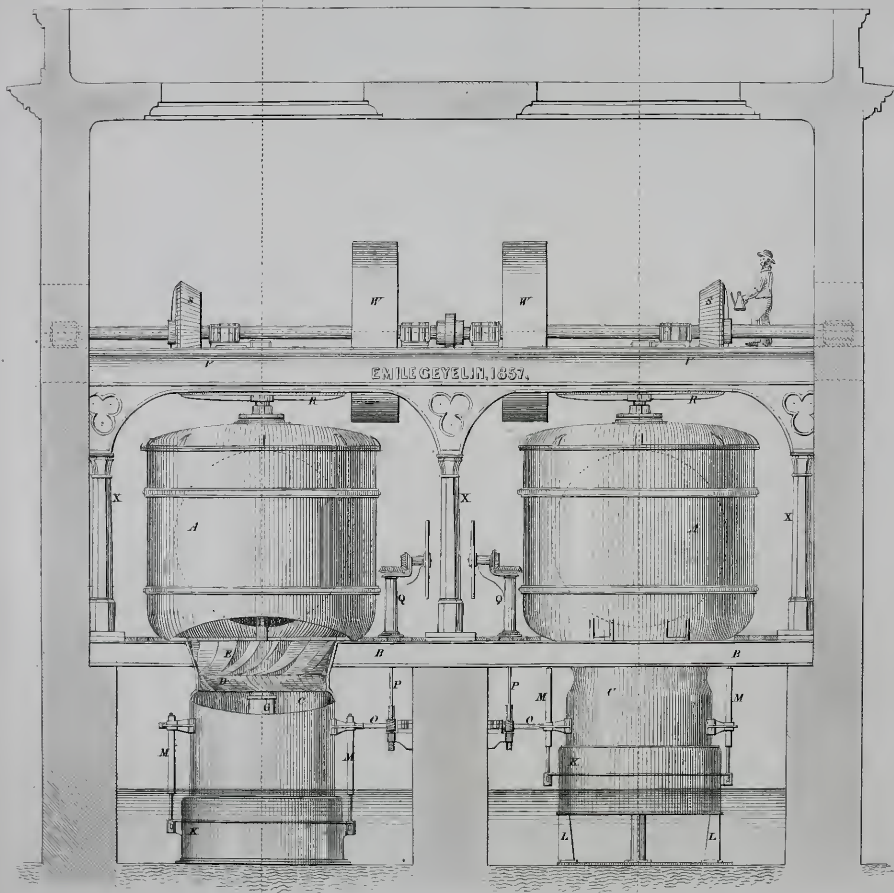

X

JONVAL TURBINES,

Erected at the Harmony Mills,

COHOES, NEW YORK.

300 Horse Power.



(A) is a cast iron chamber or reservoir, above the cylinder, containing the motor. It communicates by means of a large nozzle with the hydraulic canal, from which the required supply of water is taken. These chambers serve the purpose of penstocks; they are 9 feet diameter. The chambers are supported in cast iron girders (B), which are supported at their ends on shoulders in the walls of the wheel-house. Bolted to the lower part of the chamber, is the *wheel cylinders* (C), in the contracted part of which the *moving wheel* (D) or turbine proper revolves. In the conical part of the cylinder, above the moving wheel, the *stationary* or *guide wheel* (E) is placed; it serves to direct the water properly upon the buckets of the moving wheel. Supported on a cross bridge in the cylinder is the *step box* (G), which serves to steady the lower part of the *upright shaft* (H). The weight of the shaft, water wheel and gearing, is not however supported by the step, the shaft being supported at the top of the chamber upon Parry's anti-friction rolls; the upper box of which arrangement is keyed to the shaft, and the lower rests on the top of the chamber.

(K) is the *gate*, being a cylinder of cast iron, guided by the *stands* (L); it is raised and lowered by the racks (M), secured to lugs cast in the gate. The racks are moved by the *pinions* (N), on the shaft (O), which is supported in stuffing boxes in the cylinder (C). On the end of this shaft is a worm wheel, gearing with a screw on the upright shaft (P). The *hand wheel* apparatus (Q) is arranged to suit this screw. The motion is conveyed, from the upright shafts of the two turbines to the horizontal shaft, by the large *mortise bevil wheels* (R), gearing with the *pinions* (*s s*) on the horizontal shaft. The bearings of the horizontal shaft, and also the upper bearings of the upright shafts, are carried by bridges secured to the cast iron entablatures (V). The horizontal shaft is so arranged with a strong coupling between the wheels, and also with proper bearings, that both wheels may be worked together, or either of them alone, if required. The pulleys (W) are 7 feet diameter, and 22 inches face. The strong *columns* (X) and the entablature (V) support the bridges carrying the bearings of the shafting.

The whole affair is very compact and durable, and performs its functions in a highly satisfactory manner, both with regard to the perfect working of the several parts, and also of the per centage of power communicated from the quantity of water used.

For the Journal of the Franklin Institute.

On Plank Paving. By Charles F. Hollingsworth.

Gentlemen:—You are aware of the many disadvantages of the system of plank paving. After being in use for a year or two they rot, the spikes rust and cease to hold, and the planks are so loose and broken as to be dangerous. Any one may satisfy himself of the truth of these statements by his own observation.

In view of these defects, I have planned a composition pave. The frame composed of two string pieces of 4 × 10 inch plank, connected by cross pieces 4 feet long and 4 × 6 inches, at intervals of 6 feet.

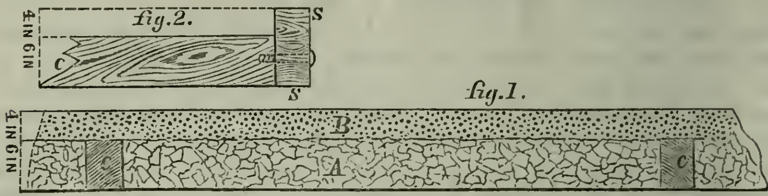


Fig. 1. Section through middle of length.
Fig. 2. Manner of joining cross pieces to strings.
A. Broken stone, pebbles, &c., not exceeding 2 inches in diameter.
B. Coarse or fine even gravel.
s s. Strings of 4 × 10 inch plank.
c c. Cross pieces 4 feet long, of 4 × 6 inch plank.

This frame is to be filled by, 1st, fragments of stone, brick, &c., (not exceeding 2 inches in diameter,) to the depth of 6 inches, or flush with the top of the cross pieces, and well laid; and on top of this a layer of fine or coarse but even gravel, 4 inches in thickness, well rolled, so as to be even with the tops of the strings.

The advantages of a walk constructed as above, will be cheapness and durability. Its cost will in the end be but a fraction of that of the plank walk, while constant use will only improve it, by making it firmer and more compact.

AMERICAN PATENTS.

List of American Patents which issued from June 1 to June 29, 1858, (inclusive,) with Exemplifications.

JUNE 1.

1. Musical Instrument; John D. Akin, Spartansburgh, Pennsylvania.

Claim—The construction of the violins suspended on pins, and by cords, attached to keys, so that they may be brought in contact with the bows by depressing the keys.

2. Telephonic Indicator for Steam Boilers; Thomas P. Akers, Lexington, Missouri.

Claim—1st, Giving the peculiar specified form to the bracket, on which the float is suspended. 2d, The precise manner specified of connecting the valve with the float stem, by means of a lower extension screw-tapped stem, oblong slot, and adjustable screw nut. 3d, Having the upper extension or stem of the valve, extend up nearly through the alarm whistle standard, in combination with the providing of a set or valve-opening screw in the upper end of said standard, and a valve-closing spring on the lower extension or stem of the valve.

3. Machine for Elevating, Measuring, Registering, and Bagging Grain; P. Barker, North Adams, Mich.

Claim—The application to threshing machines of elevators, reservoirs, measures, and registers, which will elevate the grain, measure it, and discharge it into bags, without the necessity of handling.

4. Lattice Iron Fence; Albert Bettely, Boston, Massachusetts.

Claim—Uniting the bars of a lattice at their crossings, by suitable pieces having holes or tubes through them, at any desired angle with each other, but in different and parallel planes, which embrace the bars.

5. Plate-Holders for Photographic Cameras; Arend D. Bollengs, Newburgh, New York.

Claim—The continuous glass lining of the frame, constructed, and fitted and secured in the frame in the manner specified.

6. MECHANISM FOR OPERATING SEMAPHORIC SIGNALS; Wm. Boyd, Washington City, D. C.

Claim—The particular mechanism described for operating such signs or flags, when combined and arranged as set forth.

7. ATTACHMENT FOR WATCHES, TO ASCERTAIN THE TIME WITHOUT LOOKING AT THE WATCH; Matthias W. Baldwin, Philadelphia, Pennsylvania.

Claim—The snail wheels, E and F, or either of them, the lever, the arm, and the segment ratchet, combined as described.

8. MANTLE BAR; William P. Chadwick, Edgartown, Massachusetts.

Claim—Making the mantle bar with an inclined back or bottom, and combining therewith a sliding or adjustable smoke chute, to operate therewith.

9. SASH FASTENER; Oliver Charter, Bristol, Connecticut.

Claim—The construction and arrangement of the lift, spring, thumb-piece, lever, and connexion rod, operating in the manner described.

10. LUBRICATING CAR AXLES; John W. Cochran, City of New York.

Claim—The elastic rings upon the roller, serving the double purpose of elastic bearing and oil conductors.

11. PIPE TONGS; Aury G. Coes, Worcester, Massachusetts.

Claim—My improved pipe tongs or wrench, as made not only with its movable jaw connected with a slider embracing the shank of the stationary jaw, and made adjustable thereon by a nut and screw, but with a lever separate from the movable jaw, and applied thereto and to the slider.

12. WASHING MACHINE; J. L. Conklin, Sr., and Joseph Foust, St. Louis, Missouri.

Claim—The construction and attachment of the rubber, provided with parallel concave slats, when combined and arranged with the concave provided with diagonal slats.

13. SEWING NEEDLES; James Cottrill, Studley, England; patented in England, December 28, 1857.

Claim—The sewing needle described as a new article of manufacture, that is to say, giving the space between the cutting edges of the triangular or equivalent formed needle a concave form.

14. HARROWS; John S. Davis, Washington, Ohio.

Claim—The arrangement of the harrows with the frame, the whole being constructed for operation conjointly.

15. RAKING ATTACHMENT FOR HARVESTERS; D. O. DeWolf, Brownville, New York.

Claim—1st, The employment of a cam of the form described, in combination with the devices employed for operating or stopping the motion of the rake at the will of the driver, for the purpose of imparting a variable reciprocating motion to the rake during the entire length of the platform, in a line at right angles to the course of the machine. 2d, Elevating and depressing the rake, in the manner and by the devices shown. 3d, The rake, with the inclined rod, Z, and the weight, A, combined and operating together.

16. CARRIAGE BRAKE; George L. Dickson, Carbondale, Pennsylvania.

Claim—The arrangement as described by the tongue, slotted levers, frame, box, and link.

17. SEWING MACHINES; Martial Dimock, Mansfield, Connecticut.

Claim—The gripping apparatus, operating in combination with the needle and the thread, for the purpose of drawing the loop into the path of the looper.

18. BRIDGES; Thomas Durden, Montgomery, Alabama.

Claim—Forming the arch of a series of metallic tubes, arranged transversely, and combined with blocks, binders, bolts, and cores.

19. WOOD-BURNING STOVE; M. G. Fagen, Troy, New York.

Claim—The extension, constructed similarly to the main portion of the stove, and arranged so that the stove may be extended when desired.

20. HARVESTERS; Andrew B. J. Flowers, Greenfield, Indiana.

Claim—Attaching the frame or platform, G, and wheel, C, to a frame, A, so that both may be turned or cramped by the driver from his seat, for the purpose of allowing the machine to be turned within a small compass. Also, operating the sickle from the driving wheel, C, by means of the shafts, connected by universal joints, and attached to their respective frames, when said shafts thus jointed or connected are used in combination with the arrangement of the driving wheel and platform, so that the whole may operate conjointly.

21. BEE HIVES; Philander J. Furlong, Galen, New York.

Claim—The arrangement of the glass roof with relation to the cover of a bee hive, and to the conductors.

22. SPRINGS FOR RAILROAD CARS; Heman Gardiner, City of New York.

Claim—The arrangement of the peculiar shaped semi-elliptical springs in the form of a square shaped column, held in position and made to act as one spring by the folded steel plate, so as to give the long leverage an easy, soft action, as described, the several springs and folded plate being combined and held together by the bolt passing vertically through them.

23. COMPOUND RAILROAD AXLE; Heman Gardiner, City of New York.

Claim—The combination and arrangement of the hub cylindrical parts, and axle parts, so that all may rotate together, or one wheel and short axle independently.

24. SMUT MACHINES; John German, Jr., Southfield, and S. R. Perkins, Pontiac, Michigan.

Claim—The arrangement of an annular air space, between the cylinders, C D, with openings, k, as set forth.

25. HORSE POWER; Micah Gillam, Troy, New York.

Claim—Arranging or hanging the wheel, B, as shown, or in any suitable way, so that the plane of its rotation may be variably inclined. Further, the peculiar means described for adjusting the wheel, to wit: its axis or shaft being stepped in the shaft to which the cross-tree is attached, the cross-tree being provided with friction rollers, and connected with a lever.

26. MACHINES FOR CLEANING GRAIN; J. G. Goshon, Mercersburgh, and Wm. Powers, Chambersburgh, Penna.

Claim—The scourer composed of the spike studded disk, concave rim, and concave cap piece, in combination with the brushes, and the casing enclosing the said parts.

27. Steam Valves; Henry Goulding, San Francisco, California.

Claim—The loose collar on the piston rod, for the purpose of changing the valve after the blow is given.

28. Shoulder Brace Suspender; Benjamin J. Greeley, Springfield, Massachusetts.

Claim—The arrangement and combination of two straps of unequal length, joined and running over the shoulders and across the back, and attached at two points on the sides of the waistbands of pantaloons, operating as a shoulder brace and a suspender.

29. Grain Cleaning Machines; Marquis L. Hall, Bridgeport, Connecticut.

Claim—The arrangement of a series of flat steel springs or blades, placed horizontally and parallel with each other, and secured by a wedge or key in a slot or opening in the spindle.

30. Buoyant Life-preserving State-Rooms for Navigable Vessels; Henry Hallock, Brookhaven, New York.

Claim—The arrangement specified, whereby the state-rooms of boats are rendered capable of self-detaching in the event of the hull of the boat sinking, and when detached, of floating squarely upon the water, and of affording ventilation, light, food, and fresh water, and a means whereby their drifting can be controlled from the inside by the occupants.

31. Windlass; David D. Hammond, Duxbury, Massachusetts.

Claim—The combination of the sector-shaped cams and movable cogged wheels traveling in guides, when attached to a bridle which actuates the pawl of the ratchet wheel of a windlass.

32. Combined Wash-stand and Night-stool; Francis W. Hamilton, Conshohocken, Pennsylvania.

Claim—The seat, as enclosed within a body or casing composed of the back, the two sides, and the door, in combination with the lid and its drawer.

33. Railroad Car Brakes; Thomas Hopper, Newark, New Jersey.

Claim—The lever, n, sliding bar, c, eccentric wheel, s, connected with lever, n, by means of a shaft and two universal joints. Also, brake rods, connected by reversible fulcra transverse lever, t, attached to fulcrum, I, and operated by means of the main rod.

34. Cooking Stoves; Marcus L. Horton, Claremont, New Hampshire.

Claim—The arrangement of the register, C, dampers, D D, hot air chambers, O and M, and registers, H I and J, for admitting, controlling, and regulating the heated air.

35. Signal Lantern; William Howard, Flushing, New York.

Claim—The arrangement of the conical reflector, with its large end placed towards the deflector.

36. Cotton Seed Planters; John S. Huggins and Rowland Chapman, Darlington District, South Carolina.

Claim—The arrangement of the frame and its furrow opener, ring, handles, braces, hook, brush, and cover, with the cylinder and its receivers, discharge aperture, cavity, and fender.

37. Manufacture of Brick; Thomas James, Canton, Maryland.

Claim—In the manufacture of fire bricks or tiles compounded of the ingredients described, the described process of heating or burning to convert said ingredients into a substantial fire brick or tile.

38. Self-adjusting and Vibrating Back Band Strap; Robert Jancovins, Newark, New Jersey.

Claim—The peculiar construction of the vibrating sector, provided with the slot, the pointed back support with the pin attached, the whole in connexion with the several joints, hinges, and link, or their equivalents.

39. Gas Apparatus; E. J. Manville and Samuel G. Blackman, Waterbury, Connecticut.

Claim—The peculiar combination and arrangement of the fire chamber, the retort, and the condensing chamber. Also, combining the descending toothed flanch with the cover of the condensing chamber, for the purpose of dividing said chamber into two compartments, which communicate with each other by means of a series of small induction apertures at the surface water.

40. Bedstead; William B. Johns, of the United States Army.

Claim—The combination of slats, posts, and screw bolts.

41. Hinge for Daguerreotype and other Cases; E. G. Kinsley and S. A. W. Parker, Jr., Stoughton, Mass.

Claim—Our improved mode of arranging and applying the hinge with reference to the side and end, or the end and the bottom of either half of the box, that is, extending the hinge leaf through the side of the half, and against the inner surface of its end, or the same and the inner surface of the bottom, and fastening such leaf to the end, or to the end and bottom.

42. Horizontal Water Wheel; John McCarty, Catharine, New York.

Claim—1st, The buckets, F, constructed of the form described. 2d, In combination with the buckets thus formed, the four chutes, arranged as described. 3d, The manner of operating the gates, the same being curved and attached to the levers, and connecting the levers with the rising and falling frame.

43. Straw and Wood Overshoe; F. W. Mitchell, William Wilcox, and H. T. Miller, Utica, New York.

Claim—The straw overshoe, constructed in the manner mentioned.

44. Seed Planters; Elmon Parker, Baltimore, Maryland.

Claim—The arrangement of rods and their springs with the cams.

45. Machine for Making Horse Shoes; C. H. Perkins, Putnam, Connecticut.

Claim—1st, The combination and arrangement of the hammer and the creaser with one rotary tripping shaft, so as to be operated thereby. 2d, The mode of constructing and operating the former, that is, making said former with the vertical edge and beveled top surface, and causing the said former to take two separate positions with respect to the benders and hammer. 3d, Constructing the bed or anvil with the projection or die, for hollowing the shoe or making it concave in rear of the toe. 4th, The combination of the straight toe die with the benders and the former. 5th, The combination of a set of notches, or their equivalent, with the rear end or toe, or other proper part of the former, and for the purpose of maintaining the shoe blank in its proper place or position with respect to the former during the process of bending the shoe thereon. 6th, In combination with mechanism for giving to the hammer shaft its tilting or vertical motions, mechanism for rotating the shaft, at the proper times, in order to bring the hammer and creaser to operate alternately on the shoe. 7th, And in combination with the mechanism for tilting and turning the hammer and creaser shaft, I claim the mechanism for arresting the operations of the tilting mechanism, and for preventing the fall of the hammer shaft long enough to allow of a semi-rotation of the hammer shaft, and the withdrawal of the made shoe from its place about the former, and the substitution of a shoe blank therefor.

46. Pump; S. S. Putnam, Boston, Massachusetts.

Claim—The single cylinder with its partition head, in combination with the pistons.

47. Pump Buckets; Emmett Quinn, Trenton, New Jersey.

Claim—The central diaphragm, having its under edge concentric with the connecting pin of the rod, and in contact with the bottom of its jaw, in combination with the valve, constructed and operating so that the diaphragm receives the pressure on the valve and transmits it directly to the piston rod. Also, the combination of the dovetail recess in the metallic core with the plug, penetrable by nails filling the same for the more easy and economical attachment of the valve and packing.

48. Truss Pads; H. H. Reynolds, Buffalo, New York.

Claim—1st, The transverse vertical projection, for purposes set forth. 2d, Making the pad concave below its vertical projection as represented at c, for the purposes described. 3d, Corrugating the oval face of the pad, for the purposes set forth.

49. Smoothing Iron; Abraham Rudisill, York, Pennsylvania.

Claim—The smoothing iron, with concave pressing surface.

50. Lathe for Turning Metal Shafting; William Sellers, Philadelphia, Pennsylvania.

Claim—In combination with rotating cutters, the employment of a guide bar and sliding chucks, or their equivalents, for the purpose of keeping the rough bar in the line it is intended to have when finished, and preventing it from turning or vibrating during the operation.

51. Whitewash Brush; D. W. Shaw and Wm. A. Megraw, Baltimore, Maryland.

Claim—The arrangement of the metallic box, with two or more divisions and slotted ends, and the centre or wedged-shaped bar for dovetailing the end of the bristle, and a movable or top plate fastened by pins or screws.

52. Gas Retorts; W. A. Simonds, Chelsea, Massachusetts.

Claim—1st, A common coal retort, A, with a separated return chamber, B, above and outside, but connected at the back end with the lower chamber, A, when the whole is made in one piece, and forms a continuous retort. 2d, Placing an escape pipe, b, directly under the stand pipe, E, which conducts the gas to the hydraulic main, for the purpose of drawing off the tar, and preventing it from returning to the retort, B, to crystallize and clog up the said retort.

53. Threshing Machines; H. E. Smith, Philadelphia, Pennsylvania.

Claim—Arranging the concave of a threshing machine in respect to the spiked roller, as set forth, in order that the grain may be operated in the manner specified.

54. Cooking Stoves; James Spear, Philadelphia, Pennsylvania.

Claim—1st, The adjustable hollow front and middle centre pieces, perforated on the lower side. 2d, The curved plate with lip, when connected with front plate and top plate, and hollow centre piece, or their equivalents. 3d, The hollow covers, constructed in the manner set forth. 4th, The combination of the covers, as constructed with the centre pieces, as set forth.

55. Spittoon; Wm. Staehlen, Williamsburgh, New York.

Claim—I do not claim a lid attached to the spittoon, and so arranged as to be actuated by a treadle, for such device has been previously used or applied to spittoons. I claim arranging the treadle, c, relatively with the loaded base or foot, e.

56. Rollers for Railway Bars; E. W. Stephens and Richard Jenkins, Covington, Kentucky.

Claim—The combined arrangement, as represented, of the horizontal and vertical rollers, a b c, and d d, when finished with grooves, as represented.

57. Manufacture of Gas; John L. Stewart, East Boston, Massachusetts.

Claim—Mixing the gases from the several retorts of a series alternating in one or other of them, and charging the retorts successively at stated intervals, as set forth, when the retorts are arranged with valves and passages of communication with each other, whereby the gases of different qualities are commingled before being cooled as described. Also, conducting the gas from one retort to the other through a non-conducting stopper, or other equivalent device, temporarily inserted in the mouth-piece.

58. Hot Air Furnaces; Jacob Stuber and F. Frank, Utica, New York.

Claim—The arrangement of radiators connected at the lower end with the chamber, G, and by the pipes, C, with the perforated plate, F, and the cleaning box, D, with funnel, E.

59. Machinery for Hoisting and Lowering Goods, &c.; George Thompson, Cincinnati, Ohio.

Claim—1st, The use of windlass, one or more, whether parallel or tapered, corrugated or grooved, in combination with the traveling frame. 2d, The use of the brake, or its equivalent.

60. Water Wheels; John Tyler, West Lebanon, New Hampshire.

Claim—Combining an elevated air tight cap with the casing and shaft of a water wheel whose buckets descend from a close head, for the purpose of enabling said wheel to be operated without loss of power when entirely immersed in back water, and also for the purpose of furnishing an independent upper bearing to the shaft of said wheel of so firm a character as to enable said wheel to be connected directly to the machinery to be propelled thereby, without any auxiliary shafting or journal boxes. Also, combining the flanched box of a sliding gate with the mouth of the water way of my improved water wheel, for the purpose of enabling a number of said wheels to be readily bolted to a wooden water tube or trunk, and to be operated independently of each other.

61. Harvesters; D. H. Waite, Spring Water, New York.

Claim—1st, Operating the sickles by means of the levers, L L, attached to the bar, H, the rods, n n, and lever, M, actuated by the cam, O, the parts being combined and arranged relatively with each other. 2d, Attaching the sickles to the adjustable bar, H, and used in connexion with the lever, I, whereby the sickles may be raised and lowered with facility. 3d, Pivoting the oscillating lever, M, to the bar, N, which is arranged so that the lever, M, may be thrown in and out of gear with the cam. 4th, The sliding plate, F, placed on the frame, A, and arranged so as to regulate or control the draft pole, and consequently the position of the sickles, as occasion may require.

62. Machines for Working Marble; Caleb Warner, Washington City, D. C.

Claim—The arrangement of the saws, bevel gearing, and feed screws, when employed in combination with

a lathe consisting of head blocks and pulleys, for the purpose of facilitating the working of marble or other hard stone.

63. Spoke Shave; C. H. Weston, Nashua, New Hampshire.

Claim—1st, The plate provided with arms, so as to operate in combination with the fulcrum arms, and thumbscrew, and projections, both as a cap and holder to the cutter. 2d, Making the cap or holder adjustable by means of knobs and holes, or their equivalents, that it may operate either as a simple cap and holder, or in combination with it as the upper iron of a double iron plane.

64. Manufacture of Pliers; Henry Wilkinson, Collinsville, Connecticut.

Claim—The mode of constructing malleable iron pliers, by casting one-half over the other in the manner described.

65. Horse Power; T. H., J. E., J. F., and R. J. Wilson, Athens, Georgia.

Claim—The annular tread or way, A, wheels, C, any proper number being used and attached to axles, D, and the wheel, E.

66. Mill-Stone Dress; Samson Wolff, Vicksburgh, Mississippi.

Claim—Dressing mill-stones with elbow-shaped furrows, which are partly concave in their transverse section, or curved as shown at a, and partly beveled in the same section as shown at b, and so constructed that all the feather edges of the main furrows radiate from the centre of the eye of the stone, and that the elbows or commencement of the angles are at a point nearer the circumference than the eye of the stone.

67. Construction of Wooden Saddle Trees for Harness Saddles; F. P. Ambler, Jr., Trumbull, Assignor to F. P. Ambler & Sons, Bridgeport, Connecticut.

Claim—A saddle tree having a separate or independent raised seat of wood, made substantially as described.

68. Railroad Chairs; Elizur Barnes, Assignor to Edward Crane, Dorchester, Massachusetts.

Claim—1st, The use of elastic cushions over the web of the rail, in such manner as to counteract the reaction of any downward force upon the rail, or any lateral thrust or pressure upon it. 2d, The confining of the rail between elastic cushions placed above the web of the rail, and under the base of the rail, under such a pressure that the rail will not be sensibly depressed by the weight of an engine or train passing over it, and a constant tension will be maintained upon the screws which confine the rail. 3d, The mode of bringing the upper surfaces of the rail to an exact level by the compression of the elastic cushion on which the rail rests.

69. Stoves; J. S. Brown, Washington City, D. C., Assignor to self and Joseph Kent, Baltimore, Maryland.

Claim—Introducing the air which supports combustion of the fuel in the stove, through, around, or otherwise, in contact with the smoke pipe, whereby a portion of the heat escaping through said smoke pipe is utilized in improving the combustion of fuel. Also, the valve, arranged and operating in combination with the draft pipe.

70. Apparatus for Distilling Turpentine; Leonard Bellingrath, Jr., Assignor to Duncan and Wm. McLaurin and James W. Strange, Fayetteville, North Carolina.

Claim—The arrangement of the inclosed air space between the alembic and outer jacket or case, when said air space is furnished with air passages and an indicator of heat, so that the inclosed air may be heated by conduction instead of by the direct application of the fire.

71. Corn Planters; Augustus C. Carey, Ipswich, Assignor to self and Alfred B. Ely, Newton, Mass.

Claim—The described arrangement of mechanism operating independently of the carrying wheels of the machine, for the purpose of spacing off the distances between the hills, that is to say, the roller, the arms, and the piece, O, arranged in the manner described.

72. Railroad Car Brakes; G. W. Cummings, Philadelphia, Assignor to D. K. Jackman and Joseph Hanna, Lock Haven, Pennsylvania.

Claim—1st, The combination of the draw head, C, dog, P, pushing rod, L, crank, H, shaft, E, crank, I, rods, K, and blocks, F, when the several parts are arranged to operate as specified. 2d. The mechanism for throwing lever, L, out of gear, consisting essentially of the rod, D, chain, N, and stationary pulley, O.

73. Drill for Gas Pipe; William Daggett, Troy, Assignor to A. B. Davis, New Lebanon, and W. H. Tolhurst, Troy, New York.

Claim—1st, The combination of the light and heavy springs and adjustable follower, with the drill spindle and stock or frame, for the purpose of controlling and regulating the endwise movements of the drill spindle. 2d, The clamp composed of the adjustable jaws and foot, as described, when combined with the drill stock for securing the latter to gas and water pipes.

74. Machine for Wringing Clothes; Edwin Hager, Frankfort, Assignor to self and T. D. Aylsworth, Ilion, New York.

Claim—The clasp and its attachment and adjustment to the tub, as described.

75. Sewing Machines; Charles A. Shaw and James Clark, Biddeford, and David T. Giveen, Saco, Assignors to Shaw & Clark, Biddeford, Maine.

Claim—The combination of the looping machanism described, whereby the forward and backward lateral and reciprocating rotary movements are given to the looper for the purpose described.

76. Railroad Chairs; Theodore Krausch, Susquehanna Depot, Pennsylvania.

Claim—The adaptation of a chair to, and the use of, transverse wedging, as described, or by gibbs, or if in one, two, or more parts by bands, or by whatever other mode transverse wedging may be accomplished.

JUNE 8.

77. Washboard; Silas M. Barrett, Rufus S. Lee, and Jabez M. Waters, Cincinnati, Ohio.

Claim—The teeth, arranged to the edges of corrugated sheets of metal for washboards, for increasing and holding the edges of the sheet of metal in and to the sides of the legs of the board.

78. Machine for Measuring, Registering, and Receiving Grain direct from Threshing Machines; Peleg Barker, Moscow, Michigan.

Claim—The combination and arrangement of the parts, for receiving, measuring, and registering grain direct from threshing machines. Also, in combination with the machinery for registering, two or more measures or boxes, constructed for receiving the material to be measured.

79. Raking Attachment to Harvesters; John A. Barrington, Fredericktown, Ohio.

Claim—The reciprocating or vertically moving rack piece, operating in combination with the shaft, having an intermittent connexion with the crane, and the rakes operated from the rotation of the shaft. Also, the combination of rakes and slides, to which they are hung, and the grooves of the crane arm.

80. Lock; Joseph A. Braden, La Grange, Georgia.

Claim—The slides placed relatively with the bars, as shown, and provided with the stationary teeth and yielding teeth, in combination with the bits placed on separate arbors.

81. Apparatus for Supplying Water to Steam Boilers; George Brodie, Little Rock, Arkansas.

Claim—The arrangement and combination of the cylinder, A, cylinders, B B, pistons, D D, E E, and cisterns, C C.

82. Bedstead Fastenings; George Burket, Crogham, Ohio.

Claim—Forming a bedstead fastening by a straight pin through the tenon, and two oblique pins through the mortise.

83. Mowing Machines; John Butter, Buffalo, New York.

Claim—1st, The combination and arrangement of the jointed levers, for the purpose of supporting the driving wheel, and giving flexibility to the machine. 2d, The arrangement of the carrying wheel near the heel of the cutter bar, so that the finger bar will pass through the wheel, and the cutter bar (or connecting rod) also vibrate through the wheel. 3d, Constructing the guard fingers so that they may be connected to the finger bar, and support it clear from the ground, and also allow the cutter bar to work on the underside of the finger bar. 4th, The sleeve, when connected with the spring bars, for the purpose of supporting and adjusting the driver's seat on the axle of the driving wheel. 5th, The arrangement and support of the raker's seat on the lever. 6th, Supporting and carrying the outer end of the finger bar, by means of the specific arrangement of the divider, wheel, and spring.

84. Method of Attaching Ornaments to the Ear; William B. Carpenter, Brooklyn, New York.

Claim—The mode of attaching ornaments to the ear without boring or piercing holes therein, by the use of the hooked shaped wire, B, in connexion with the wire, A, and the spring, C.

85. Sewing Machines; David W. Clark, Bridgeport, Connecticut.

Claim—Regulating the extent of the feed by expanding or contracting the rear end of the lever.

86. Washing Machines; Edward B. Clement, Barnet, Vermont.

Claim—The adjustable foot brake, in combination with the slotted elbow brakes and connecting rods.

87. Admitting Light and Air through Steps, &c ; John B. Cornell, City of New York.

Claim—An illuminating and ventilating riser for door sills, &c., composed of a perforated and partially glazed front plate, combined with an inner inclined glazed sash.

88. Preserve Cans; H. G. Dayton, Maysville, Kentucky.

Claim—The employment of the rubber band in combination with a metal cover and metal clamp.

89. Bed Bottom; Benjamin Griffin, Lawrence, Massachusetts.

Claim—The mortise bar, the open link, the lifter spring with the tapered slat, when combined and arranged for a bed bottom.

90. Writing Desk; Joseph H. Grimsley and Perry J. Aukney, New Lexington, Ohio.

Claim—The application to, or construction of, writing tables or desks, in the manner described.

91. Machine for Cutting Out Stumps; Frederick Kettler, Milwaukie, Wisconsin.

Claim—The circular frame, A, and the revolving frame, E, in combination with the cutting apparatus.

92. Apparatus for the Manufacture of Beer; George Habich, Roxbury, Massachusetts.

Claim—The combination, arrangement, and connexion of the copper, the mashing tun, the filtering vessel or vessels, and the hop vessel, whereby the several operations connected with each of such parts, can be conducted, through the agency of the heat, from one furnace, and steam from its copper. Also, combining and arranging the wort warmer with the copper, the hop vessel, the filtering vessel or vessels, and the mashing tun. Also, the combination of the condenser, the hop vessel, the copper, the filtering apparatus, and the mashing tun, as connected and arranged so as to operate together. Also, the arrangement and combination of the water heater, the mashing tun, the filtering apparatus, the hop vessel, and the copper, as connected and made to operate together.

93. Extension Table; William Heerdt, City of New York.

Claim—The metal plates attached to the upper and lower surfaces of the bars, swaged or so formed as to be provided with ledges and grooves which fit one into the other.

94. Machine for Grinding and Cutting; Franklin B. Hunt, Richmond, Indiana.

Claim—The arrangement in the same machine of the two peculiarly constructed hinged adjustable troughs or boxes, spring set bar, and cutter or grinder shaft, with spring key and radial arms.

95. Stop Watch; Charles E. Jacot, City of New York.

Claim—The manner of allowing motion to the independent train by a pin, or its equivalent, on the escapement lever acting on the arms of the "whip" or "fly," and letting one arm pass at each pulsation of the balance.

96. Platform Scales; J. F. Keeler, Cleveland, Ohio.

Claim—The application of a device for leveling the bearings of platform scales, when arranged as described. Also, combining with platform scales, a weighted lever or indicator, in such a manner that the platform scales may be used either with or without it.

97. Bench Plane; H. L. Kendall, Baltimore, Maryland.

Claim—The compensating piece, formed so as to be tightened by the gripe, and have its face move parallel to itself, as specified, whereby the opening in front of the bit is not diminished by adjustment of the compensator.

98. Device for Attaching Bits to the Brace; Samuel U. King, Windsor, Vermont.

Claim—The mode of fixing the tool or auger in its handle or bit stock, viz: by the projection on the tool, in connexion with the wedge and the spring applied to the handle or stock, and the socket thereof.

99. Revolving Fire Arm; Moses Kinsey, Newark, New Jersey.

Claim—Furnishing the dog with the additional tooth, arranged to operate in combination with square or equivalently formed bottom parts of the backs of the teeth of the ratchet wheel.

100. Carriage Springs; David M. Lane, West Philadelphia, Pennsylvania.

Claim—Providing the extremities of the plates with sockets to receive the ends of the wooden springs.

[The invention consists in constructing the spring of steel and wood combined—curved bars of elastic wood, such as hickory, being secured in a peculiar way to the inner and steel main plates.]

101. Burners for Vapor Lamps; C. B. Loveless, Syracuse, New York.

Claim—The crescent-shaped generating chamber, d, and its arrangement with the siphon tube, chamber, c, and burner, f.

102. Refrigerating Pitcher; W. W. Lyman, West Meriden, Connecticut.

Claim—The particular location of the valve, viz: in the throat of the nozzle, when said valve shuts into instead of against the opening, and is constructed with double sides, or made hollow, provided with a projection lip or shoulder, and having its seat provided with a lip or shoulder.

103. Piano-Forte Action; John V. Marshall, Albany, New York.

Claim—The formation and position of the butt, as described. Also, the combination of the butt spring, and back check.

104 Device for Operating the Bolt to obtain Taper in Shingle Machines; Elijah Morgan, Morgantown, Virginia.

Claim—The combination of the eccentric roller, the swings, and the lever stop and switch.

105. Method of Tanning; Jesse Morgan, Sumterville, South Carolina.

Claim—The compound composed of saccharine matter, glauber salts, and muriate of soda, in about the proportions set forth, for the purpose of expeditiously completing the proceess of tanning.

106. Breech-Loading Fire Arms; George Wettorse, Baton Rouge, Louisiana.

Claim—1st, The percussion rod in a movable breech piece, in combination with the sliding bolt, when so arranged that the lock in the act of firing shall both make fast the breech-piece and fire the charge. 2d, The construction and use of the globular surface on the front end of the movable breech-piece, in combination with the end of the cylindrical cartridge case, for the purpose of more effectually preventing the escape of gas at the joint. 3d, The construction and use of the lever, when arranged for the purpose of retracting the cartridge case.

107. Brake for Wagons, &c.; Benjamin B. Munroe, South Danville, New York.

Claim—1st, The brake bar, when jointed in the manner set forth. 2d, The extension perch, constructed in the manner specified.

108. Machine for Cutting Irregular Forms; William N. Oakes, Dana, Massachusetts.

Claim—The combination of the two carriages, having a rectilinear motion at different speeds, with the elongated pattern, tracers, and cutter, for the purposes set forth—not intending to claim an elongated pattern as such, or combined with other machinery to cut irregular forms, but only its combination with two carriages having rectilinear motion at different speeds.

109. Improved Heliographic Instrument for taking the Sun's Altitude; John Oakes, City of New York.

The main object of my invention is to find the altitude of the sun when the horizon is obscured—but I by no means intend to confine its application to that condition, as it is obvious that it can be used as well when the horizon is visible—but it is under the former condition that it possesses an advantage over the quadrant and sextant. I do not confine myself to the use of any particular sensitive preparation for the concave surface of the hemisphere. But I

Claim—The hollow hemisphere having its concave surface prepared with a sensitive coating, and having an orifice in the centre of its equatorial plane, through which to admit the sun's rays, to act upon the said sensitive coating. Also, the graduated plate with its appendages, combined with the hollow hemisphere.

110. Combined Umbrella and Head Rest; Charles G. Page, Washington City, D. C.

Claim—Combining a head rest with an umbrella, as set forth.

111. Bee Hives; Thomas Prosser, Birmingham, Pennsylvania.

Claim—The combination in bee hives of the labyrinthian passages, suspended shafts, and glass entrances, when said parts are constructed and arranged relatively to each other, in the manner set forth.

112. Ratchet Presses; Philip H. Raiford, Mobile, Alabama.

Claim—The combination of the eccentric pawl and ratchet with the platen of a press.

113. Revolving Heels of Boots and Shoes; James H. Roome, City of New York.

Claim—The combination of the slotted or perforated slide, bent at its forward end, with the hub bed shank and notched rim plate, arranged as set forth.

114. Excavating Machine; Nathan Sanders and F. T. Sherman, Chicago, Illinois.

Claim—The extension fulcrum piece, in combination with the dipper shaft, so that when the dipper shaft arrives at the point necessary for shifting the fulcrum, the fulcrum piece may be thrown into gear and be carried to the extremity of the crane.

115. Ink Rollers; Alexander Schimmelfennig and Julius Ende, Washington City, D. C.

Claim—To manufacture ink rollers out of elastic gums, such as caoutchouc or gutta percha, or of compounds of the latter, in the modes described, or in any similar modes.

116. Automatic Grain Weighing Machine; William and Thomas Schnebly, Hackensack, New Jersey.

Claim—The weighing of grain, &c., automatically, under a continuous flow or otherwise, without employing the gravity or weight of grain, being weighed for the purpose of checking or cutting off the supply of grain entering into the receptacles to be weighed, or for the purpose of discharging the grain from the receptacles in which it has been weighed, during the period of the process of weighing, or when the quantity of grain is being determined or weighed. Also, providing the hopper with hinged valves, each having a lever with a weight on it, and attached thereto, when used in combination with projecting arms, which are made to operate the same. Also, the balanced valve in its location below the hopper, and above the stationary chute or bridge, when used in combination with projecting arms, cams, &c., and a pendulum with an adjustable weight. Also, the toggle joints, in combination with vertical hinged valves.

117. Steam Power Metre; George Schuh, Madison, Indiana.

Claim—1st, The combination of the one independent piston, working in its cylinder, and actuated in opposite directions alternately by the steam from opposite ends of the engine cylinder, acting successively on its opposite sides or faces, carriage, pendulum, main spring, secondary spring, friction wheel or roller, and disk, arranged for operation together. 2d, Driving the disk in both directions of its travel, by cords operated by the engine, whereby a velocity corresponding to the velocity of the piston of the engine is at all times, and throughout both strokes, communicated in a positive and accurate manner to the friction wheel. 3d, Providing the driving cords with compensating springs, when said cords and springs are combined for action with the reciprocating disk and reciprocating head block, or its equivalent, of the engine piston rod, to prevent material pause of the disk at the end of each stroke, and irregularity in the action of the disk, by the driving pull on either cord, alternately producing stretch and the relaxing of either cord, when not acting as a driver for the purpose of securing accuracy in registering.

118. Harvesting Machines; Wm. H. Seymour and Dayton S. Morgan, Brockport, New York.

Claim—1st, The combination of the changeable pinions and gear wheel actuating the cutters of reaping and mowing machines, with their centres so situated relatively, that the changeable parts shall always exactly fit and gear when properly placed, and not otherwise. 2d, The combination of the replaceable pinions with the series of holes for the axle of the driving wheel of reaping and mowing machines, so arranged with relation to each other that while the rate of motion of the cutter is changed, the height of the cutter from the ground may be varied at the same time, the proper rate of motion for the different heights being always secured, and in such manner that the changeable parts shall always fit and gear when properly placed, and not otherwise.

119. Punching Machines; D. S. Sherman, Lowell, Massachusetts.

Claim—The manner of punching a nut, washer, or other article, from plate or bars, by forcing it half way out (more or less) in one direction into a die, and then forcing it entirely out in the opposite direction into another die, for the purpose of making the outside edges of the nut perfectly square and free from a sharp or burr edge.

120. Provision Cutter; William Smith, Cincinnati, Ohio.

Claim—The arrangement of the semi-cylindrical piece and guide slides, arranged with the stock and circular plate, for feeding the provision to the cutters. Also, the arrangement of the screws, J J K and S S, with the cutters and plate for adjusting the cutters from and to the plate.

121. Bedstead; William St. Charles, Fairmont, Virginia.

Claim—The combination of the old devices newly arranged in the following manner—the collar, the tenons, the holes, the nuts, and cylindrical bearded wire, arranged in combination with the construction of the head and foot board, the whole being arranged to operate conjointly.

122. Tailors' Pressing Machine; L. B. Storrs, Canton, New York.

Claim—The lever, arm, "goose," and treadle, when connected together and arranged relatively with each other and the press-board, so as to operate as set forth. Also, the particular manner of connecting the "goose" to the arm, viz: having the "goose" provided with the spindle, which passes loosely through the sphere of the universal joint, whereby the "goose" is allowed an independent rotary movement.

123. Metallic Caps for Bottles, Jars, &c.; William J. Stevenson, City of New York.

Claim—The construction of the cap with the band fitted and united to the exterior of a rim formed upon its head, and with a lap which is left unsoldered or simply tacked so as to be capable of being laid hold of, to strip the band from the exterior of the head when it is desired to open the bottle or vessel.

124. Smut Machines; Duncan M. Vance, Urbana, Ohio.

Claim—1st, The reciprocating wire cloth rubbers in connexion with a rotary fan, constructed as described. 2d, The double inclined grain screen combined with reciprocating rubbers.

125. Grain Separators; A. J. Vandegrift, Lexington, Kentucky.

Claim—The arrangement of the adjustable feeding tube and distributor within the wind trunk, so that the grain may be fed in without allowing a draft or current of air to follow it, and so that the grain may be presented to the blast in thin sheets, and not have their gravitation affected by counter currents or eddies, or accelerated by falling upon each other, or sliding down from above.

126. Hydraulic Rams; J. F. Warner, Philadelphia, Pennsylvania.

Claim—Using the water after passing the puppet valve by conducting it to a vessel or cup, or basin, having a waste opening or openings in the bottom, and used as a power upon a lever or beam to overbalance another power which is greater when the cup is empty, and less when the cup or basin is full. The conducting pipe, the closed valve chamber, the set screw fixed over the valve, the fulcrum, and beam or lever, all the parts used in combination for the purpose of keeping any hydraulic ram to which it may be attached in motion.

127. Door Locks; L. Whitney, Toledo, Ohio.

Claim—The combination of the slotted plate, B, arbor, E, and washer, G, as described.

[The invention consists in the peculiar manner of securing the arbor of the knob in the lock, said knob having a bit attached to its inner end, and operating the bolt as the arbor is turned.]

128. Harvesters; Thomas Wendell, New Albany, Indiana.

Claim—The arrangement of the rake on the endless belt, operated around and below the stationary platform, in combination with the shaft, belt, and lever.

129. Sash Fastener; J. B. Whitherle, Upton, Massachusetts.

Claim—The combination and arrangement of the retractor, the pall or catch, the spring, and the lever, applied in the window sash and in relation to the rack of the sash frame.

130. Planing Machine; J. A. Woodbury, Winchester, Massachusetts.

Claim—1st, Protecting the face of the board in tongueing and grooving by pressure surfaces, constructed and operating with rotary cutters. 2d, The swivel guide when made to operate as described. 3d, Placing the under cutter at or near the end of the frame, for the purpose specified.

131. Apparatus for Supporting and Adjusting Gravers for Engraving Machines; John Hope, Assignor to self and Thomas Hope, Providence, Rhode Island.

Claim—The curved arm or bar and the graver carriage, as combined, together and with the graver lever, and made to operate therewith. Also, the adjustable weighted arm, in combination with the balanced tracer

arm or graver. Also, constructing the tracer carriage in two parts, in order that the tracer or graver may be adjusted in a vertical direction to cylinders or rollers of different sizes. Also, making the arm and the stop adjustable on their shaft and rod, in order to bring them into proper positions to cause the elevation of the graver under any situation of it on the surface of the cylinder, and when the lever is moved backward. Also, making the weight in two parts, for the purpose specified.

132. Machine for Finishing Soldered Tubing; Edmund Jordan, Assignor to the Benedict & Burnham Manufacturing Co., Waterbury, Connecticut.

Claim—The files or cutters attached to a tilting stock, which is fitted to a reciprocating slide, and operated by means of the connecting rod, crank, and stops. Also, the clamp formed of the two plates attached to the levers, which are connected to a treadle, the whole being arranged to operate as specified.

133. Extension Table; George Pratt, Boston, Assignor to John A. Ellis, Cambridge, and J. E Hazleton, Newton, Massachusetts.

Claim—The combination of the auxiliary turning stop and its recess, or the equivalent thereof, with the main stop applied to one of the slides, and the rebate made in the other. Also, the combination and arrangement of the two spring catches, catch bars, and the space, whereby during the motion of the supporter on its hinges, one catch is made to pass between the two catch bars, and one catch bar to pass between the two catches.

134. Sewing Machines; A. W. Sangster, Assignor to V. M. Rice, Joel Thayer, James Sangster, and Eliza Remington, Buffalo, New York.

Claim—1st, The spring thread carrier, in combination with the stationary arm and feeding mechanism operating together. 2d, The combination of the shuttle and hook fastened together, or their equivalents. 3d, The shuttle carrier, the case, and the cross-piece, when operating together.

135. Hose Couplings; Charles Vander Woerd, Assignor to Alvah Clark & Sons, Cambridge, Massachusetts.

Claim—The arrangement and combination of an elastic tube with the heads of the couplings, so as to cover the joint, and allow the same to be kept tight by the pressure of the liquid.

136. Mode of Applying the Power of the Steam Engine; Jacob Widmer, Assignor to self and Howard Gilbert, New Haven, Connecticut.

Claim—1st, The combination of the rack with the cams, B B, and grooves, b. 2d, The combination of the levers with the rack and cams.

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137. Apparatus for Manufacturing Gas; John Absterdam, Boston, Massachusetts.

I do not claim the naphthalizing boxes or contrivances, made as described on pages 145 and 146 of Parnell's Applied Chemistry, or any other contrivance similar to them, my invention being different from such contrivances, as I employ for the passage of gas, spiral or serpentine unobstructed passages made of cloth, or any other fibrous or porous material, connected with shallow chambers or reservoirs, or their equivalents. In carrying out my invention I do not employ a capillary material which shall so fill the channel or gas passage as to materially obstruct the flow of gas through the same. And, furthermore, by my arrangement of the gas passage with reference to each chamber and its leading pipes, I effect such an extended circuit of gas in contact with the vaporizing surfaces as to enable me to bring the whole apparatus into a very small compass, in comparison with others in use, and having the same amount of naphthalizing power. I do not claim the apparatus made of metal, or other suitable material, merely, as such solid apparatus is merely the skeleton, to sustain the passages or tubes made of cloth, which line such solid chambers, accurately forming a tubular passage of cloth through which the gas, air, or saturated vapor is driven. But I

Claim—The arranging of tubular passages made of cloth, or other similar porous fabric, which elevate by capillary action the fluid in the chamber, allowing space sufficient for the passage of the æriform fluid, and allowing complete saturation of the latter, in the manner specified.

138. Disconnecting Car Axle Boxes from Pedestals; Wm. D. Arnett, Chicago, Illinois.

Claim—The lugs, recesses, and grooves, arranged with the pedestals and box cases, for disconnecting the box cases from the sides of the pedestals.

139. Brick Machines; Gerard Bancker, City of New York.

Claim—1st, The use of the flanches, in combination with the feed box and rotating moulding plate, or equivalents. 2d, The use of the air expeller piston, in combination with the rotating moulding plate and the flanch, or equivalents, actuated simultaneously with the feed box. 3d, In combination with the rotating plate the reciprocating feed box, having the flanches attached thereto, the bell crank pin on the cam, when these several parts are constructed in the manner set forth.

140. House Bell; Jason Barton, East Hampton, Connecticut.

Claim—The arrangement of the parts in a house bell, as specified.

141. Machine for Cutting Glaziers' Tins; John G. Baker, New Brunswick, New Jersey.

Claim—The rotating drum provided with the cutters, two or more, in combination with the stationary die or bolster provided with the recesses and the feed rollers.

142. Machine for Gathering the Toll in Grist Mills; Joseph Bartholomew, Dundee, New York.

Claim—The employment or use of a rotating cylinder provided with chambers, and having valves or movable bottoms so arranged and operated that as the cylinder rotates the grist will be conveyed to the hopper of the stones, or any proper receptacle, and the toll gathered or taken from the grist.

143. Apparatus for Manufacturing Gas; Wm. Beaumont, Paterson, New Jersey.

Claim—In combination with the retort, the series of longitudinal flues and their communicating passages.

144. Machines for Crushing Stones; Eli W Blake, New Haven, Connecticut.

Claim—The combination of the following features in the construction, arrangement, and movement of the jaws, to wit: 1st, Making the acting faces of the jaws upright, or so nearly so that stones will descend by their own gravity between them. 2d, Making the acting faces of the jaws convergent in such manner that while the space between them at the top is sufficient to receive the stones that are to be broken, that at the bottom shall be only sufficient to allow the fragments to pass when broken to the required size. 3d, Giving a short vibratory movement to the movable jaw. I disclaim the above three features severally, and limit my claim to their joint co-operation.

145. Attachment of Pipes to Water-Closet Basins; Wm. S. Carr, City of New York.

Claim—The socket, rod, and nut, connecting the pipe and arm.

146. Quilting Frame; Alanson Brown, Rochester, New York.

Claim—The construction of the frame and its combination with the standards, said frame consisting essentially of the revolving bars, the end pieces, and the rigid bar, which bar revolves in the standards. Also, my method of converting the whole into a cradle by means of the reversible feet.

147. Sash Holder; Stephen R. Brown, East Kingston, New Hampshire.

Claim—Applying the spring so as to be capable of being slid or adjusted lengthwise on its abutment, and so as to bear against the lever bearer in whatever position the spring may be set.

148. Operating Churns; Addison G. Brush, Great Bend, Pennsylvania.

Claim—The arrangement of the revolving platform, having short arms or tappets attached and operating the churn dasher, in connexion with arms and shaft.

149. Mode of Heating Rotary Boilers; C. S. Buchanan, Ballston, New York.

Claim—Combining and surrounding a cylindrical boiler made to revolve upon its axis, with one or more stationary envelopes, made of fire-brick, or any other equivalent material, arranged at such distance from said boiler as to allow the fire and other products of combustion to pass around the boiler, in the manner specified. Also, arranging the stationary envelopes around a rotary boiler, in such manner as to leave both the ends and the middle of the said boiler uncovered, for the respective purposes of protecting the journals at the ends of the boiler from heating, and of allowing access to the man-hole. Also, in combination with a boiler constructed and operating in the manner described, I claim two furnaces arranged symmetrically in relation to the boiler, whereby the heating of said boiler can be effected in a more economical and uniform manner.

150. Seeding Machines; Samuel Burnside, Reading, Ohio.

Claim—The movable conveying tubes with hoes attached, in combination with the seed slides.

151. Pocket Supporter for Billiard Tables; John E. Came and Simeon Havens, Boston, Massachusetts.

Claim—The arrangement of a strip of vulcanized rubber, or its equivalent, along the inner edge of the pocket supporter, and between the same and its leather covering.

152. Lime-kilns; George W. Calkins and Henry White, Cleveland, Ohio.

Claim—The arrangement of a lime-kiln, or parts of a lime-kiln, as described, that is to say, the arrangement of the furnaces provided with the diagonal mouths, in combination with the dampers, the ash pits, the cold blast aperture, the flue, and a hinge chute draw, when the several parts are arranged with relation to each other.

153. Hay and Cotton Presses, &c.; Lincoln L. Cummings, Munnsville, New York.

Claim—The caps, sliding plates, and the bar, in combination with the screws and nuts.

154. Machines for Hulling Rice; Philip Dickenhof, Philadelphia, Pennsylvania.

Claim—The combination with the compensating delivery spout of a revolving clearer, interposed between the said spout and the hulling mechanism or surfaces. Also, the revolving clearer, C, with its opposite acting sides or edges shaped to produce similar action in opposite directions of travel, and the outer ends of said edges formed to counteract the centrifugal throw of the clearer.

155. Device in Feed Motion of Shingle Machines; Elbridge Drake, Gardiner, Maine.

Claim—The application to shingle machines of the knee combined with the slide, in such manner as will produce the desired effect.

156. Watch Cases; James M. Durand, Newark, New Jersey.

Claim—Connecting the inner case of a watch to the outer one by a hinge and pivot, so that said inner case may be raised up and turned over, to make a hunting or open-faced watch without opening but one of the bizzles.

157. Windlasses; John Harvey, Carmel, Maine.

Claim—My mode of obtaining power by a windlass and ropes, constructed as specified; and I particularly claim making the windlass with the conical or tapering parts in conjunction with the cylindrical parts, D E, or either.

158. Hand Printing Presses; Charles A. Haskins, City of New York.

Claim—The application of the ink reservoir with the plunger or gate of gutta percha, or its equivalent, for letting down the ink, in combination with the spring bed plate and the inking roller, which is accommodated to the face of the type in the process of inking, by means of slots in the arm and spiral springs attached to the same.

159. Sewing Machines; Abial C. Herron, Remson, New York.

Claim—The arrangement of the mechanism by which the feeding surfaces upon both sides of the cloth are moved as stated, and by which the motions produced are combined and applied at the same time to the feeding surfaces upon both sides of the cloth, viz: the arrangement of the rocker shafts above and below the table, with the connecting and intermittent pressure mechanism, or its equivalent, whereby I am enabled to feed the article to be sewed between two smooth surfaces, both having a positive uniform, independent, and intermitting motion. Also, the arrangement of the mechanism, or its equivalent, for interweaving two threads upon the upper surface of the cloth.

160. Manufacture of Burning Fluids; Levi L. Hill, Greenport, New York.

Claim—1st, The use of caoutchousine for imparting greater volatility, as well as greater stability, to my compounds. I wish to be distinctly understood as claiming the use of caoutchousine only in combination with the liquids described. 2d, The liquids described as newbian oils, A B C D, having the composition and properties set forth, to be used singly or in such relative proportions and admixtures as may appear necessary to accomplish the purposes set forth.

161. Reducing Wheel Tires; Iris Hobson, Stout's Grove, Illinois.

Claim—The sliding curved anvil formed of one straight and two semi-elliptic spring bars, and furnished with two holding jaws, in combination with two toothed stationary jaws and a vise screw.

162. Field Fence; Thomas Hoge, Waynesburgh, Pennsylvania.

Claim—The round hole or mortise through the sill or chair, with the projecting ends of the boards pas-

ing through said hole or mortise, and the adjustable brace, with a hole or series of holes in its upper end, and the battens.

163. Skirt Hoops; David Holmes, Westfield, Massachusetts.

Claim—1st, The connexion of the hoops, by interlacing hoops in the manner described. 2d, The attachment of the loops to the hoops by two lipped clasps, applied in the manner described. 3d, The formation of eyes in the braiding at the extremities of the hoops, to serve as slides.

164. Apparatus for Distilling Oils; John Howarth, Salem, Massachusetts.

Claim—1st, In combination with the still, the reservoir placed above the level at which the oil is to be kept in the still, and the worm heated as described, or in any other manner whereby heated oil under pressure is fed into the still in such a manner as to keep the oil therein always at one and the same level. 2d, The use of a pipe communicating with the several vapor spaces within the still, whereby the condenser is relieved from the incondensable gases that are generated in the still, and which prevent the effective condensation of the vapor. 3d, A cutter formed in the neck of the still, for the purpose specified.

165. Post and Pile Driver; Oliver Hyde, Benicia, California.

Claim—The suspending of the gin from the top by any of the mechanical appliances known to accomplish that end, thereby enabling a post-driving machine to accommodate itself to any unevenness of the ground over which it may be moving. Also, the sextant-formed frame to keep the gin in position.

166. Manufacture of Round Belting; Marshall Jewell, Hartford, Connecticut.

Claim—A new manufacture of round leather belting, composed of two or more thicknesses, stitched and twisted, as shown.

167. Tanning Leather; Horace G. Johnson, Cleveland, Ohio.

Claim—The use of the Anthemis Cotula, or any other species of Maruta, either separately or mixed with Terra Japonica in any proportion, or combined with alum and common salt, or their chemical equivalents, in the manner set forth, not intending, however, to confine myself to the exact proportions named.

168. Adjustable Hanger for Shafting; Wm. Johnson, Lambertville, New Jersey.

What I claim is not the employment of a box with trunnions or pivots solidly attached thereto, nor a box movable by means of a ball and socket, nor the adjusting of the box in position, either vertically or laterally, by means of screws, or screws and nuts, with or without a vertical stem, carrying the box with it, nor in a particular proportion, size, or shape (except in the particulars mentioned of any of the parts). But it is the cylindrical instead of the globular form of the curved surfaces of the box, the axis of each cylinder (of which the opposite surfaces are parts) being at right angles to the other, and the axes of both being at right angles to the axis of the box or tube itself, so as to allow either pair of opposite plugs or blocks to serve as trunnions, or pivots, or centres, upon which the box or tube may turn or revolve longitudinally, and so that the action or pressure, or strain of, or upon, the box, in whatever direction or from whatsoever cause, shall always be perpendicular to the several surfaces of the box and of the plugs or blocks pressing against the same, and so that the plugs or blocks become so many perfect abutments, always acting perpendicularly and never obliquely against the point of resistance, thereby securing a greater degree of compactness, simplicity, and strength relatively to the weight of material and costs of construction, than by any other methods.

Claim—The two pairs of cylindrical surfaces at right angles to each other and to the axis of the box, in connexion with the four plugs or blocks, each with a cylindrical curvature fitting to that of the box, and secured and adjusted by the four screws.

169. Retorts for Generating Gas; Wm. H. Lauback, Philadelphia, Pennsylvania.

Claim—1st, The construction of the retort with a convolute passage made in two parts, fitting together in the manner described, whereby a great amount of heating surface is obtained for the conversion of the vapor into permanent gas, and provision is made for cleaning out the passage. 2d, Combining the movable cover with the valve of the charger, by means of a T-shaped head on the valve stem and pins, inside the said cover, or their equivalent, to regulate the supply of fluid material to the retort while in operation by turning the said cover.

170. Corn Huskers; Lucius Leavenworth, Trumansburgh, New York.

Claim—Attaching to the arm or other part of the chair, the two rollers, or their equivalents, in the relative position. Also, the combination of the hinged lever, curved chisel, and rollers, with a seat or chair.

171. Ivory Frame Composition; J. M. Legare, Aiken, South Carolina.

Claim—The employment of any saponified material, in combination with a neutral clay, as a basis of my composition.

172. Seeding Machines; D. B. Neal, Mount Gilead, Ohio.

Claim—The peculiar arrangement of the gauge slide, the screen, and the pin, with the bottom and seed slide, for the purpose of regulating the quantity of seed to be discharged, and at the same time preventing straws or chaff from choking the slide.

173. Fastening for Double Doors; George H. Lindner, Hoboken, New Jersey.

Claim—The catches having cams attached to their inner ends and arranged with the slides, having springs c, placed on them, in connexion with the plate, f, and springs, e, the whole being applied to the door, B, so as to be used in connexion with the fellow door, C.

174. Door Locks; John R. Marston, City of New York.

Claim—The sliding key-hole cover, constructed as described, and acting in combination with the bolt, for the purpose of making a door lock proof against any outside communication when locked from the inside without requiring any adjustment.

175. Cotton Seed Planters; Arnold McDonald, Salem, Mississippi.

Claim—The combination of shaft, T, its grooved seed distributing wheel and sterrers, with hopper.

176. Lamps for Lighting Gas; Charles McIntosh, Jersey City, New Jersey.

Claim—Constructing the lamp with a vertical, or nearly vertical, passage through it, when used in connexion with a lantern.

177. Washing Machine; B. D. Morrell, Windham, Maine.

Claim—The fitting and adjusting up and down of the rubber over and within a hollow detachable metallic socket projecting up from the bottom of the tub by means of a central hole, a revolving spindle, and sliding collar.

178. METALLIC WINDOW BLINDS; Charles Neer, Troy, New York.

Claim—1st, Connecting the slats of metallic blinds by means of staples inserted into a folded metallic strip, when bent up and secured. 2d, The circular spring tenon formed on the ends of sheet metal, blind slats to be inserted into the hole in the stiles, and cause the necessary friction, but prevent the tenon bending. 3d, In combination with said sheet metal blind slats, the metallic frames formed of the detachable rails and tapering stiles. 4th, Beveling the stiles each way from the line of holes receiving the ends of said metallic blind slats, for the purpose of giving freedom to the slats when opened, but forming a tight joint when closed.

179. CRACKER MACHINE; Charles Neer, Troy, New York.

Claim—1st, The grating perforated with conical holes, in combination with the dough-box and follower. 2d, The worker, having the eccentric motion specified, and provided with the cavities. 3d, The plate, 7, formed with the convex parts, 15.

180. APPARATUS FOR RAISING SUNKEN VESSELS; Milo Osborn, Osbornville, Ohio.

Claim—The sinker arranged with the rod, adjustable hooks, and bail, and in combination with the buoy and clasp, the same operating in connexion with the cables, A and D.

181. CLOTHES FRAME; Enos Page, Streetsborough, Ohio.

Claim—The combined sections, I J K, composed of the vertical jointed and folding standards, in combination with the adjustable cross-bars, when arranged as described.

182. INVALID BEDSTEAD; Joseph Parker, Liverpool, England; patented in England, December 14, 1857.

Claim—1st, The mode described of constructing and operating the movable parts of invalid bedsteads. I claim, particularly, the combination of the movable head-board with the movable frame, and also the attachment of the bolster to the head so as to prevent it from slipping behind the patient. 2d, The use and application for the purposes mentioned, or for analogous purposes, of the movable foot-board, and the mode of constructing and operating the same.

183. MACHINES FOR CLEANING GRAIN; Wm. Partridge and G. W. Shaw, Ellicott's Mills, Maryland.

Claim—The combination of the spike-studded beaters, O, upon drum, D, with the notched and grooved dress of the outer casing. Also, the combination of the pan, chamber, channels, and blast trunk, adjustable by means of the vertically moving spout attached to sliding breast piece.

184. STRAW CUTTERS; C. P. Perry, Norristown, Pennsylvania.

Claim—The shaft, E, with its pinions, J, the shaft, Z, with its wheel, R, and the spindle, P, with its pinion K, when the said shafts are linked together, and the said wheels and pinions are arranged with respect to each other.

185. CAR WHEELS; John Pugh, Franklin, Tennessee.

Claim—The employment of the hollow or tubular spoke, combined with the solid spoke, for the purpose of respectively receiving the strain arising from the unequal contraction in cooling of the different volumes of metal in the inner and outer sections or portions of the rim independent of each other.

186. GAS BURNERS; A. H. Ray, Boston, Massachusetts.

Claim—The described gas burner, consisting essentially of the chamber, heating tube, and the cone, or its equivalent.

187. DEVICE FOR HOLDING SHEEP WHILE BEING SHEARED; D. R. Reed and J. E. Chapman, Castile, New York.

Claim—The adjusting wheels and bed fitted to a suitable base.

188. METALLIC HUBS FOR CARRIAGE WHEELS; S. J. Russell, Chicago, Illinois.

Claim—The wedge-shaped projections when employed in connexion with the spaces and hooks for receiving the spokes, and locking the two parts of the hub firmly together. Also, the use of india rubber to protect the woody fibre of the spokes.

189. RETORTS FOR DISTILLING OILS FROM COAL; T. D. Sargent, Washington City, D. C.

Claim—The use of the cylinder retort made of clay, and so arranged as to revolve upon its axis during the process of distillation, or in place of a whole revolution, making only three-fourths of a revolution and turning back again, thus producing an oscillating motion for a clay retort.

190. CONSTRUCTION OF HARNESS PADS; R. M. Selleck, City of New York.

Claim—1st, The cast iron frame having the depressions, E E, in combination with the recesses, O O, cast on each side, for the side straps to fit in. 2d, The under plates or clamps to secure the pads, provided with hooks fitting into the depressions and recesses on the frame, the ends of the pad being secured by screws.

191. LIGHT REFLECTOR; Wm. F. Shaw, Boston, Massachusetts.

Claim—A luminous reflector or lamp shade made of conducting or slowly conducting material, constructed so as to operate as described, both as to the reflection of light and the dispersion of heat and light.

192. WEATHER STRIPS FOR DOORS; M. M. Shellaberger, Joliet, Illinois.

Claim—The plate or strip, C, provided with end pieces pivoted to the casing by pivots or screws, passing through oblong slots in the end pieces, and having one of the plates connected to a slide provided with a catch, which, when the door is closed, passes within a recess in the door, and over plate, I, the above parts being used in connexion with the plate, J.

193. FURNACES FOR BURNING BAGASSE, &c.; Evan Skelly, Plaquemine, Louisiana.

Claim—The angular internal projections, central cone, and air passages, combined and arranged as described.

194. ICE PITCHER; George W. Smith, Hartford, Connecticut.

Claim—Surrounding double wall pitchers with an additional concentric shell, and their double bottoms and covers with corresponding additional disks, for the purpose of protecting the same from being battered through carelessness in handling, and other causes, and preserving them from the direct contact of external heat, and thus keeping a colder body of air in contact with them, of such temperature as shall not only more thoroughly preserve the cold temperature of the ice and water contained in the said pitchers, but also prevent the condensation of air on the exterior surfaces of the same, and the consequent dripping of the water thus accumulated therefrom.

195. HARVESTERS; S. F. Smith, Magnolia, Illinois.

Claim—The application of the rake to the reel of a reaping machine by means of the slides, guides, rollers, longitudinal planes, and rod spiral spring, when these several parts are constructed as specified.

196. Brick-kilns; G. L. Smull, Meadville, Pennsylvania.

Claim—1st, The moulding wheel, in combination with the press, toggle joint, P, and the incline plane, O, for operating the followers, U U. 2d, The hooks, S, operated by the crank, J, for operating through the rod, R, the toggle joint, F. 3d, The half wheel, I, in combination with the pinions, H and G, cranks, n and m, and connecting rod, 11, for giving intermittent motion to the moulding wheel.

197. Clasp for Skirt Hoops; Thomas Wallace, Jr., Ansonia, Connecticut.

Claim—The clasp formed with lips at each side of each end, and with teeth at its edge.

198. Piano-Forte Actions; Henry Steinway, City of New York.

Claim—The spring attached to an arm at the back of the jack, and arranged relatively to the hammer, and in combination with the spring thus arranged and applied, the hooked screw applied to the arm, as described, to adjust the spring relatively to the hammer, and confine it laterally in a proper position.

199. Locomotive Signals; A. E. Turnbull, Springfield, Ohio.

Claim—The combination of the additional lever, F, upon which the second stake or obstruction, H′, operates, with the lever, E, for sounding the whistle, whereby the duration of the blowing of the whistle can be continued to any required extent, and stopped.

200. Gun Carriage; G. J. Van Brunt, Dedham, Massachusetts.

Claim—The application of friction apparatus to the gun carriage and tongue, in such manner that when the carriage is being retracted or under recoil, it shall be elevated in a manner to raise its wheels off the deck or floor under it, and cause the whole weight of the gun and carriage, or that of the latter, to be borne by the tongue or friction apparatus, and in a manner to increase the friction and pressure of the friction bearers or the tongue on their supporting surface. Also, the arrangement of the shaft, the friction bearers, and their eccentrics and strips, or equivalents, with reference to the gun carriage and the tongue thereof. Also, the combination of the tripper with the tongue and friction apparatus, the same being for the purpose and to operate as specified. Also, the combination of the adjustable spring stop with the gun carriage and the lever of the friction apparatus.

201. Field Fence; H. S. Wentworth, Norvell, Michigan.

Claim—The combination with tapered movable posts of movable panels attached alternately upon opposite sides.

202. Harvesters; S. Williams, Stockton, California.

Claim—1st, The combination of the draft piece, side piece of frame standard, lever, and rod, connecting the same with the frame arranged for joint operation. 2d, The short axles, depending arms thereof, suspension pieces, finger bar, and wheels, connected together, in combination with the aforesaid arrangement for elevating the finger bar.

203. Hulling Stone Dress; John A. Wilson, Dover, New Jersey.

Claim—The manner of generating and constructing furrows in hulling stones, for the purpose of equalizing the distribution of the grain over the surface of the stones, so as to prevent clogging at the eye, and retaining the grain on the periphery of the stone until perfectly hulled.

204. Machines for Sizing Hat Bodies; S. W. Wood, Washington City, D. C.

Claim—Sizing or planking hat bodies by rolling the bat continuously forward, that is to say, in one direction between endless belts running in opposite directions, and at different or variable velocities.

205. Seed Drills; M. C. Younglove, Clevelend, Ohio.

Claim—The connected series of compound pocketed seed cylinders, in combination with the sliding sleeve journal and the adjusting screw.

206. Argand Gas Burners; Wm. W. Batchelder, Assignor to Wm. L. Townsend, City of New York.

Claim—Surrounding the cylindrical flame of an argand burner with supplemental jets, placed at such distances from each other, and from the central flame, that they shall neither intermingle with each other nor with said flame, and of such number as will produce the effects described.

207. Rotary Cultivators; E. T. Bussell, Shelbyville, Indiana, Assignor to Wombaugh, Brothers, Cincinnati, Ohio.

Claim—The arrangement of machinery, substantially as set forth, for breaking up and disintegrating the earth for purposes of agriculture.

208. Propeller; C. F. Gardiner, Assignor to self and H. D. Gardiner, East Boston, Massachusetts.

Claim—The arrangement of the wheels, w w, on the heads of the shafts, with the rack, r, and wheel, w, geared therewith, operating to reverse the paddles, in combination with the wings and tongues of the shafts.

209. Revolving Fire Arm; F. H. Harrington, Springfield, Massachusetts, Assignor to Horace Smith and D. B. Wesson.

Claim—The combination of the stop bolt, the jointed thumb piece, of the hammer, with the revolving cylinder.

210. Breech Loading Cannon; J. H. Murrill, Assignor to self, James Flynn, and Peter Emrich, Baltimore, Maryland.

Claim—The employment of the slot serving as a pocket for the reception of the charge in a proper position for entering the bore, when arranged in combination with a packing. Also, the employment of the screw B, in combination with the packing, operating in the manner as described, for the purpose of closing the chamber and ramming the charge at the same operation.

211. Spring Bed Bottom; George E. Safford, City of New York, Assignor to self, F. G. and F. T. Ward, Buffalo, New York.

Claim—The jointed frame, hinged beneath and supported above, in combination with the springs.

212. Car Wheels, &c.; Webster Willoughby, Assignor to W. H. Wizeman, Markwell, Mississippi.

Claim—The combination of the slotted bars or spokes, A, and oscillating hub, E, and disk, B, for suspending the axle of the wheel in advance of the centre of the tread portion of the wheel, with the additional disk or wheel, H, for keeping the tread portion of the wheel and disk, B, in a vertical position during its revolution.

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213. FLOATING REVOLVING WHARF; Henry Albro, Covington, Kentucky.

Claim—The revolving or floating pier for changing the position of the berth of ferry boats, in order to facilitate their landing when strong currents or other obstacles interfere.

214. BRICK MACHINES; Francis Allen, Boston, Massachusetts.

Claim—The combination of the prismatic striker and its edge clearer, with the hopper and the mould carrier. Also, the application of the mould joint coverer or bar, to the discharging passage of the hopper, and so as to cover the joint between the two abutting ends of two moulds. Also, the arrangement of each mould directly over a joint between two sections of the mould carrier, and so as to cover and protect the said joint, in combination with the projection and recess, or the equivalent thereof, applied to the mould and the carrier.

215. RECIPROCATING ROTARY ENGINE; George Ambrose, City of New York.

Claim—The arrangement and combination in a rotary engine, in the manner specified, of the following peculiar features, to wit:—1st, A stationary axle furnished with two ports, one answering as the supply and the other as the exhaust to a series of cylinders, said ports being separated by a transverse S-shaped partition, so that the steam shall be received at one end of the axle and exhausted through the other. 2d, A series of revolving cylinders, with pistons whose rods have friction rollers on their outer ends. 3d, An annular grooved eccentric rim, which has an inner and outer bearing for said friction rollers of the piston rods. 4th, Two cut-off slides, one arranged at the supply and the other at the exhaust port of the hollow axle, and intermediate between the revolving hub of the steam cylinders and said stationary hollow axle, for the purpose of regulating the admission of steam to, and the escape of the same from, the cylinders, as may be desirable or necessary—all of the above parts being for united use.

216. PREVENTING CARS FROM RUNNING OFF THE TRACK; Leverett Ball, Auburn, New York.

Claim—The double flanch railroad car wheels, with the broad space between the flanches, and the strong flat-edge flanch or car wheels, in combination with the iron plate, the guide rail, the clasp, swivel rail, and the ends of the rails.

217. DEVICE FOR ADJUSTING PLANE IRONS; Leonard Bailey, Winchester, Massachusetts.

Claim—The combination of the movable friction plate separate from the plane iron and its adjuster, or the equivalent of the latter, with the throat of the plane stock.

218. FURNACES FOR HEATING STEAM BOILERS, &c.; Gideon Bantz, Frederick City, Maryland.

Claim—The arrangement of the fire chambers, A A, contracted throats, c c, auxiliary combustion reservoir, C, provided with the ceina-reversa bridge plate, m n, and door, h′, reverberatory chambers, D D, with doors, h h, and the diving or direct flue, E.

219. RAILROAD CHAIR; E. R. Barnes, Brookfield, Connecticut.

Claim—The two jaws attached respectively to the base plate and wedge, and provided with the horizontal projections, the base plate having a recess formed on it to receive the wedge, and the wedge secured firmly in position by the key.

220. HEMP HARVESTERS; Thomas Berry, Louisburgh, Kentucky.

Claim—1st, The combination of the adjustable front supporting wheel, obliquely set slotted guide plate, and adjusting lever. 2d, Arranging the reel and the gearing which drives it on the jointed frame, which is pivoted to the main frame and connected to an adjusting lever. 3d, The combination of transverse bundling bars, one stationary and the other pivoted, so as to vibrate up and down with the main propelling axle, by means of a pin on the axle, a pivoted lever, a spring rocking arm, and connecting link.

221. HANDLE FOR SCREW-DRIVERS; Oliver Bond, Buffalo, New York.

Claim—The ratchet ferrules, C and D, when attached to the handles, A and B, and used in combination, the same being protected by the surrounding band ferrule, E.

222. REFRIGERATOR; John D. Burton, Charlestown, Massachusetts.

Claim—The arrangement of the separate refrigerating chambers, the ice chamber, and the air passages leading from the latter into the separate refrigerating chambers.

223. COMBINED RAILROAD TRACK AND CAST IRON PAVEMENT; Walter Bryent, Boston, Massachusetts, Assignor to Daniel D. Badger, City of New York.

Claim—The combination of a cast iron pavement and railway, cast and united together in suitable sections. Also, the combination of the tenons and mortises on the ends of the rails, and the alternate over and under lapping tongues on the edges of the pavement, for the purpose of interlocking the adjacent sections of the combined pavement and railway.

224. RAILROAD CAR SEATS AND BERTHS; Sidney C. Caso, Detroit, Michigan.

Claim—1st, Extending the backs of the seats nearly to the floor of the car, and suspending said backs on pivots or centres a short distance above the lower ends, and providing the seat portions with pins near their vibrating edges, which enter and rest in corresponding mortises formed in the sides of the car, and partitions forming the ends of the seats. 2d, The peculiar method of connecting the berth platform together, and raising them out of the way to the roof of the car, when not desired to be used, and lowering them to form berths, by means of segmental grooves formed in, or secured to, the transverse partitions, and round and oblong pins or studs on the ends of the platforms which traverse in them, the said grooves being so formed, and in such relation to each other, as to enable the berth platforms to be rolled upward, connected, and tilted, and suspended near the roof of the car, and detached and lowered as occasion may require.

225. MACHINE FOR RAISING MARL DIRT, &c.; Thomas F. Christman, Wilson, North Carolina.

Claim—The adjustable marl dirt and water elevator, in combination with the movable pinions, cross-bar, and endless apron, and with the additional elevator and extension piece.

226. MODE OF APPLYING LEVER POWER; George E. Clay, Stillwater, Minnesota.

Claim—The combination of the oscillating arms or bars secured to the pinion, E, and cog wheel, F, which turn loosely on the horizontal shaft, A, and pinions, K L, and cog wheel, M, for gearing the two arms together.

227. REGULATORS; John H. Cooper, Philadelphia, Pennsylvania.

Claim—Guiding the inverted cup, O, by an arm, P, when the latter is loosely jointed to the casing and to the cup. Also, combining the coupling screw, D, the valve seat, e e, chamber, E, and the inclined outlet, B, with each other.

228. Gas Burners; Robert Cornelius, Philadelphia, Pennsylvania.

Claim—Constructing fish-tail gas burners with an interior annular space extending to the commencement of the holes of discharge. Also, the auxiliary holes, in combination with a fish-tail burner.

229. Car Couplings; C. B. Cotter, Harrisburg, Pennsylvania.

Claim—The peculiar arrangement of coupling bar, A, as constructed, in combination with the spring jaws, the lugs, and the right and left screw, for the purpose of making a self-connecting and self-disconnecting car coupler and friction bumper.

230. Corn Harvesters; R. B. Corbin and James Morris, St. Augustine, Illinois.

Claim—The rake teeth and box attached to the body of the wagon, and made to communicate with said body by means of the inclined trough or plane.

231. Metallic Lath; John B. Cornell, City of New York.

Claim—Forming an improved plaster-supporting metallic surface of a closely united series of sheet metal sections, whose edges are first inclined inwardly and then outwardly into substantially the shape shown.

232. Metallic Rolling Shutters; William W. Cornell, City of New York.

Claim—My improved sectional metallic shutter, composed of a series of sections whose edges are first brought to the proper shape and then combined with each other by securing said sections to elastic metallic strips.

233. Pans for Evaporating Cane Juice; D. M. Cook, Mansfield, Ohio.

Claim—The evaporator, in combination with fire-place and flue, the rockers, the levelling frame, the rubbers, and the flanches.

234. Cutting Button Holes; Charles Currier, Providence, Rhode Island.

Claim—The lever provided with cutters, in combination with the adjustable bed and gauge. Also, the snips, made separate from the parts of the cutters and attached to the plates by means of the screws, whereby the snips may be readily detached from the parts, c, of the cutters, and sharpened or ground with facility.

235. Ploughs; Alexander Dickson, Hillsboro', North Carolina.

Claim—The supplemental land-side and coulter, arranged and applied to the plough, as shown.

236. Coupling Box for Shafting; Wm. B. Dunning, Geneva, New York.

Claim—1st, The coupling box. 2d, The means used for securing the same together, as described.

237. Repairing Cast Iron Cylinders; Samuel Falkenbury, Susquehanna Depot, Pennsylvania.

Claim—The uniting the old and new cast iron in the box of steam cylinders, which consists of drilling the broken parts for increase of expanding surface, and the application of a charcoal or other fire to equalize the expansion previous to pouring the metal.

238. Metallic Roofing; J. C. Gaston, Oxford, Ohio.

Claim—1st, Connecting the plates for a metallic roof by means of yielding joints, consisting of only two thicknesses of metal, and formed by overlapping the flanches turned in the same direction on opposite edges of each plate, in combination with the boarding of the roof, formed of different thickness of plank, to correspond with the difference in the level of the plates, when connected. and so arranged as to give support to the under side of the plates, and also to the joints. 2d, The combination of the lock on the lower corners of the plates (formed by the hook in one plate, and the slot in the other, or their equivalents,) with a side joint formed by the overlapping of the plates.

239. Corn Huskers; Burton Hazen, Cincinnati, Ohio.

Claim—The stationary and rotating knives and rotating bar or hammer combined.

240. Shingle Machine; Jerrie R. Hall, Brunswick, Maine.

Claim—1st, The combination of rods with their pins, thimbles with their slots, sleeves, and the palls, in combination with notched wheels and feed rollers, for feeding the bolt to the saw. 2d, The arrangement of frame in relation to the other parts, for fastening and holding the bolt while being sawn. 3d, The hinged fender with its cord and spring. 4th, The combination of springs, clutch lever, j′, lever, R, car, n, with its catch, s′, cams, Q and P′, in combination with pulleys for giving motion to the carriage

241. Corn Planters; Pascal Hatch, Norwich, Vermont.

Claim—Combining the glazed receptacles with grain boxes, and with the delivering apparatus connected therewith.

242. Air Heating Furnaces; John P. Hayes, Philadelphia, Pennsylvania.

Claim—1st, Admitting hot air to the upper surface of the fire for the combustion of the gases arising therefrom, by making the fire tiles or lining of the fire chamber in numerous vertical sections, with the depressions in the adjoining sides of the same, so that when the said sections are placed together, side by side, in the fire chamber, air spaces or flues will be produced between, so as to heat and discharge currents of air into the upper part of the fire chamber, in the manner described. 2d, Making a direct communication between the said air flues and the ash pit, by means of the openings, w w, or their equivalents, in the foundation plate upon which they rest. 3d, Forming the top and side plates of the furnace body, so that each of its said top and side plates, l and l′, may be combined with a row of pipes, opening at each of their ends, upon the same side of the plate, as described, and produce hot air flues through the body of the furnace, when the said plates are united together at their upper edges.

243. Camphene Lamps; Elias J. Hale, Foxcroft, Maine.

Claim—An improved lamp having its wick tube made adjustable and movable with respect to its solar cap, or having the latter made adjustable with respect to the wick tube.

244. Machine for Setting Spokes in Hubs; Andrew Hafer and George Wilkinson, Colon, Michigan.

Claim—The disk, A, having teeth formed on a portion of its periphery, and curved grooves made in its inner face, the plate, B, provided with slotted arms in which jaws are placed, the plate being provided with a pawl and handle, and fitted to the disk by means of the pin and nut, the pin forming the axis of the sweep.

245. Seeding Machines; Samuel F. Jones, St. Paul, Indiana.

Claim—The slides, arranged respectively within the box, E, and tubes, F G, and operated through the medium of the tube, shaft, pendent, and rods.

246. Metallic Wheels for Vehicles; Thomas McConaughy and James McCollum, Burnsville, Alabama.

Claim—The combination of the feathered box, wrought metal bands, and system of braces, with the screw rods and rim of the wheel.

247. Corn Harvesters; Darius Landon, Wyandotte, Ohio.

Claim—The platforms, in combination with the endless belts and shock supporters, for carrying the shocks of corn through the machine, and leaving the same in a standing position on the ground.

248. Wash-boards; Joseph Keech, Waterloo, New York.

Claim—The combination of the central beaded rib with the corrugated plates.

249. Horse Shoe Machine; William W. Lewis, Cincinnati, Ohio.

Claim—1st, The combination with the stationary table, of the mandrel, the stationary front die, sliding side dies, and top die, all applied to operate together. 2d, Operating the dies which form the sides of the shoe, by means of the upright sliding rods with their wedge-shaped ends, the levers, and the cams on the shaft.

250. Gang Ploughs; Don C. Matteson, Stockton, California.

Claim—The arrangement of the false beam, goose neck, axle, lever, catch, and the system of ploughs attached to their frame.

251. Vapor Lamp Burners; A. M. Mace, Springfield, Massachusetts.

Claim—The use of the heating and vaporizing tube or retort charged with asbestos and fluid.

252. Vapor Lamps; A. M. Mace, Springfield, Massachusetts.

Claim—1st, Combining the cap or heat retainer with vaporizing tubes or retorts, when so arranged over the flame as to operate in the manner set forth. 2d, The combination of the heat retainer and vaporizing tube, connected with the elevated reservoir, the whole arranged and operating with respect to the valve, c', and burner, K.

253. Corn Shellers; William H. Main, Liverpool, Ohio.

Claim—The use of the balance wheel, in combination with the open hub jaws, teeth, and springs. Also, a series of spur wheels, T, arranged with spiral springs and sliders, or their equivalents, and in combination therewith the spiral cam, by which the spur wheels are driven.

254. Seed Planters; Joseph McKown, Gardstown, Virginia.

Claim—The arrangement of two or more alternately operaring slides, cut-off device, crank shafts, intermediate gearing, adjustable standards, and extension connecting rods.

255. Corn Husker; Lemuel R. Mears, South Abington, Massachusetts.

Claim—A combination of a breast shield, a supporting bar, and cutting apparatus; the breast shield to be applied to a person, and the cutting apparatus and supporting bar to be operated in manner specified. Also, the arrangement of the cutters and bearer, viz: so as to extend in opposite directions from the supporting bar and the slider.

256. Railroad Car Seat; John Miller, Paterson, New Jersey.

Claim—The two horizontal rotating seats, attached to the face or stand, in combination with the pivoted backs attached to the seats, and arranged with the bars having the rods and springs attached, and the pins connected with the upright parts of the seat.

257. Treatment of Metallic Sulphurets; Alfred Monnier, Camden, New Jersey.

Claim—The process of obtaining oxides of iron, copper, cobalt, nickel, zinc, or other oxides, from their native sulphurets, or arsenic sulphurets, by mixing them in a state of powder with the substance, as described, in order to expel all, or nearly all, the sulphur and arsenic.

258. Seeding Machines; Wm. Morehouse, Davenport, Iowa.

Claim—The cams attached to the axle and laterally moving rods, K M, attached respectively to the shafts, H g, the seed slides, E, being attached to the shaft, H, by rods, G, and the shaft, g, being attached to a slide, z. Also, the markers attached to the frame, when said markers are used in connexion with the cams and rods, M K, for operating the seed distributing device.

259. Air Cells for giving Buoyancy to Ships and other Vessels; Samuel Nowlan, City of New York.

Claim—The arrangement of a series of cylindrical air vessels beneath the deck or decks of vessels, in combination with the reels and their appurtenances, whereby the said air vessels may be readily removed from or brought into position at pleasure. Also, the flexible induction tube communicating through the hollow reel shaft with the air pump and the air vessels, by means of one or more suitable valves.

260. Combination Locks; Stuart Perry, Newport, New York.

Claim—1st, A key of such construction, in combination with a lock without a key-hole, or other opening, from the outside to the working parts inside, that the said key may be applied to the lock without the aid of an index, figures, letters, or other marks that require a light to be seen, and which key shall govern with precision all the necessary movements of the shaft by which the slides and tumblers of the lock must be adjusted. 2d, In the construction of locks without key-holes, the employment of two movable shafts, one of which adjusts the slide tumblers, both being accessible from the outside, and one within the other. 3d, The method of adjusting the slides, by means of the two movable shafts, which, when operated, are guided in their movements by the key above described. 4th, The restorer, in combination with cam, shaft, and bet, by which all the movable parts in the lock are moved by the force of the hand only, and in the locked and unlocked position are held fast. 5th, So constructing the ring cam that it shall move the slide carriage at the proper moment, and that it shall hold said carriage fast at all other times. 6th, The steel arm, or its equivalent arms, the peculiarly shaped slide. 7th, The piston for coupling the slide carriage cam, with the wheel of the shaft.

261. Ploughs; H. M. Platt, Darien, Connecticut.

Claim—The arrangement of the screw-shaped ploughshare, having wings with boxes, wheels, and roller.

262. Clamping and Laterally Feeding the Log in Saw Mills; J. C. Past, Wilmington, Delaware.

Claim—The method of clamping and holding the log, and also the device by which the lateral feed of the log is regulated.

263. Solution for Cleansing Woolens, &c.; E. F. Prentiss, Philadelphia, Pennsylvania.

Claim—The employment of silicate of soda solution by itself, when prepared and used substantially as described, for cleansing and softening the fabric in the fulling mill or wash tub as a wash mixture.

264. Apparatus for Sifting Coal Ashes, &c.; L. H. Proctor, East Sangers, Massachusetts.

Claim—The arrangement of the inclined partition or chute, and the two discharging openings with respect to the sieve, made capable of being revolved in manner set forth. Also, in combination with the discharging passages arranged so as to lead out of the sieve chamber, a flap or valve, so combined or connected with the turning sieve as to operate with respect to the two discharging passages, as described, during the rotary or tilting movements of the sieve.

265. Cheese Vat; H. A. Roe, West Andover, Ohio.

Claim—Attaching the milk vat to the casing by a hinge joint, or its equivalent, and so arranging the whey gate that the weight of the milk vat and its contents will act as a lever in keeping the cellar and packing in close contact with the inner surface of the water chamber. Also, in combination therewith, the short legs, E', and the jointed legs, E''.

266. Cabinet for Sewing Machines; F. A. Ross and W. H. Marshall, City of New York.

Claim—The hinged case to form a sewing platform.

267. Oil Cup for Machinery; Robert Ross and William Holland, Philadelphia, Pennsylvania.

Claim—The combination of the spring valve stem with the screw valve in the intermediate chamber, each operating in conjunction with, and at the same time independently of, the other to the extent and in the manner set forth. Also, the air passage within the stem, in combination with the oil passage around the stem.

268. Ore Separator; H. P. Russ, Russville, California.

Claim—The series of inclined circular plates in which the water passes from one plate on to the next, while the metallic particles are retained in cavities in the surfaces of said plates.

269. Furnaces of Boilers and Stoves; S. F. Savage, Albany, New York.

Claim—The arrangement of the air chamber with the perforated bottom of a conical or equivalent shape, placed in the upper part of the fire chamber, with the concave surface downward toward the fire, and with a central aperture leading to the chamber of inflammation.

270. Cooking Stoves; S. B. Spaulding, Brandon, Vermont.

Claim—The extending of the bottom of the stoves and flues at the back end, so as to form a boiler seat for the reservoir, so that by the peculiar arrangement of the sliding plate or damper, the reservoir can be heated at pleasure without affecting in the least the other operations of the stove.

271. Frame for Drying Clothes; Chester Stone, Ravenna, Ohio.

Claim—The manner of constructing a clothes frame, consisting of the standard, head, arms, braces, and cords.

272. Portfolio File; P. W. Tay, City of New York.

Claim—Separately, the elastic bands, E E, and the loops, F F, arranged as described. Also, the combination of the portfolio cover with the file, loop, and bands.

273. Gearing for Machinery; Wm. Webster, Jefferson Co., Washington Territory.

Claim—The compound annular cog-wheel. Also, in combination with a wheel, having two or more concentric rings of cogs, the use of a corresponding number of pinions on one shaft, or of a shifting pinion arranged for combined operation with the wheel.

274. Gas Retorts; Charles N. Tyler, Washington City, D. C.

Claim—1st, The combination of the cavity with the outlet of the hydrogen retort. 2d, Elongating the end of the retort, so that the cavity may be arranged on the inside of the furnace.

275. Masting and Rigging Vessels; Wm. Webster, Jefferson Co., Washington Territory.

Claim—1st, Substituting for the compound and connected masts now in use on large vessels, independent and disconnected masts made of a single stick of timber. 2d, Attaching the masts to the hull by shrouds placed at the angle with the mast as described. 3d, The truss bands for attaching the yards to the masts, and holding them at any desired point thereon. 4th, The lift bands to which the lifts and slings are attached.

276. Oil Cups for Lubricating Engines; S. H. Whitmore, Cincinnati, Ohio.

Claim—The combined arrangement of the external valves, G and H, mounted on a central stem, and operating in connexion with the globe.

277. Machine for Replacing Railroad Cars on the Track; John White, Boston, Massachusetts.

Claim—A "car replacer," consisting essentially of the beam, with its two separate and independent carriages running on rolls, with the screw jacks for raising the beam.

278. Paddle Wheels; George Wingate, Philadelphia, Pennsylvania.

Claim—Connecting side wheels for steamboats with recesses in which blocks are arranged to slide toward and from the centre of rotation of the wheel as the latter revolves, by means of the plates, when constructed and operating on the blocks, as described, so as to cause the partitions between the said recesses to assume the character and duty of floats throughout a portion of the circumference of the wheel, the outer surfaces of the said blocks being level with the outer edges of the partitions throughout the remaining portions of the circumference.

279. Machines for Picking Cop Waste; A. A. Wood, Jersey City, New Jersey.

Claim—The combination of a reciprocating toothed bed with vibrating toothed feeding rollers, or their equivalent, with a stationary toothed cover, when the teeth are constructed and arranged in reference to each other in the manner described, to pass the waste or cotton through the machine without seriously rending the fibre, and at the same time securing a precise and even feed to the bed by the combination of the vibrating toothed rollers working at a corresponding speed.

280. Restoring Waste Vulcanized Rubber; Francis Baschnagel, Beverly, Massachusetts, Assignor to the Beverly Rubber Company.

Claim—The application of heat from 150° to 600° Fah., to waste vulcanized rubber, with or without immersing it in cold water, or any other cooling fluid, as specified, for the purpose of restoring the same, so that it may be used again in the manufacture of india rubber goods and substances, hereby expressly disclaiming all and every right to the application of artificial heat to new rubber, vulcanized or not vulcanized, and to the application of heat to rubber in any manner and for any purpose except as above set forth.

281. Safety Vault Covers; E. L. Brown, Boston, Massachusetts, Assignor to B. F. Brown, Bangor, Maine.

Claim—The hinged lid, in combination with the guards, so arranged as to support the lid when raised, and to lock it when closed.

282. Valves for Dry Gas Metres; C. C. Lloyd, Assignor to William Hopper and R. W. Gratz, Philadelphia, Pennsylvania.

Claim—1st, The construction of the rotary valve with a series of breaks or edges, arranged and operating so as to scrape the upper surface of the valve seat. 2d, The drip and valve seat, arranged and operating so as to collect and carry off any liquid deposit in the metre. 3d, The valve carriage, arranged and operating as described.

283. Skirt Hoops; R. J. Mann, Brooklyn, New York, Assignor to L. A. Osborn, Newark, New Jersey, and I. J. Vincent, City of New York.

Claim—1st, The peculiar formation of the slide, the said slide being made of brass, or other metals, and having its slides bent two ways, the one clasping the end of the loop and made fast thereto, and the other end made to slide freely on the hoop. 2d, Securing the hoop to the perpendicular straps, by means of small clamps. 3d, The formation of a bustle or corrugated projection on the upper hoops on the back of the skirt.

284. Cooking Stoves; G. G. Richmond and G. W. Pittock, Assignors to selves, C. Phelps, and J. Lown, and said Pittock having assigned his interest in the same to D. B. Carver, Troy, New York.

Claim—1st, The arrangement of the passages provided with dampers, with hot air chamber, and slide, in the oven, as described, whereby the intensely hot air of the chamber may be directly applied to the otherwise insufficiently heated underside of articles baking upon the slide, and to the upper side of those on the oven bottom. 2d, In combination with the fire pot, plate, chamber, passages, and slide, in the oven, arranged together in the stove, as described, the top plate of the oblong hot air chamber, constructed substantially as represented, whereby the heat of the air admitted into the oven between the two tiers of articles baking is augmented.

285. Stuffing Boxes; H. F. Read, Assignor to self and S. J. Burr, Brooklyn, New York.

Claim—1st, The metallic rings placed upon the shaft, for the purpose of protecting from friction the shaft and flexible tube, within which said rings are placed. 2d, The arrangement of the flexible tube on the outside of the metallic rings, so as to allow said flexible tubing to give or twist equally its whole length, and also to carry with it each ring a proportionate distance according to the distance traveled by the shaft. 3d, In combination as described, the thimble, as used for the purpose of packing the joint at the end of the outside case, and at the same time holding permanently one end of the flexible tube. 4th, The combination of the flexible tubing and the metallic rings working together on the shaft, together with the metallic casing, D.

286. Sewing Machines; H. S. Snow, Assignor to self and G. F. Snow, Meriden, Connecticut.

Claim—The combination of the lifting feeder with lever, or its equivalent, for lifting the feeder from th cloth, by the descent of the needle carrier.

287. Rivetting Machine; P. B. Tyler and Wm. Jones, Springfield, Massachusetts, and Benjamin Lathrop, Sandusky, Ohio, Assignors to P. B. Tyler, aforesaid.

Claim—The employment of a pean, as described, shaped to the configuration of the head of a rivet, and operated in the manner set forth, by which a rivet head is formed by a succession of light blows around the circle.

288. Sewing Machines; A. F. Johnson, Assignor to F. F. Emery, Boston, Massachusetts.

Claim—Taking the loop from the needle by a revolving hook, operating in the manner set forth. Also, in combination with the revolving hook, the groove and the lip, or its substantial equivalent, for holding the loop distended.

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289. Arrangement of Steam Coils in Evaporating Vessels; H. O. Ames, New Orleans, Louisiana.

Claim—The arrangement of the convolute curved radiating pipes, the pockets, the straight water pipes, and the steam and water chambers.

290. Sewing Machines; William F. Barnes, Buffalo, New York.

Claim—The looper strip or point, when secured to the revolving rod or piston, and arranged and operating in combination with the step or looping aperture, spring, and cylinder. Also, the cloth-guiding apparatus, as constructed, arranged, and operating in combination with the feeding device.

291. Drain Plough; Moses Barrowman, Buffalo, New York.

Claim—1st, The centre piece, for the purpose of a main frame or support for the other parts of the plough. 2d, The arrangement and combination of the adjustable wheels, the arms, shaft, lever, and segment, relatively to each other and the plough.

292. Machinery for Braiding Cordage; James A. Brazin, Canton, Massachusetts.

Claim—The combination of the gears, m m, geared circle, 9 9, and gears, o o, with their curved arms, whereby one spool and its strand is made to travel around two stationary ones, and thus form an interlocking twist, as described. Also, with the above combination of devices, the use of a series of double gears, o o o o, whereby the spools can be revolved in either direction, according to the direction of the twist of the yarns.

293. Manufacturing Braided Cordage, Webbing, &c.; James A. Bazin, Canton, Massachusetts.

Claim—My improvement in the manufacture of cordage, webbing, or other similar fabrics, which consists in laying up or so combining the strands as to form an interlocking twist, in which each and every strand passes around and interlocks with two others, and thereby brings the strain equally upon each strand.

294. Grinding Mills; Bachus A. Beardsley, Waterville, New York.

Claim—1st, The alternate combination of grinding shells, C G, with shells, F I, the shells, C G, having a smaller diameter or curve than the shells, F I, so that by merely duplicating the above parts, and employing them in connexion with cases, D H, the capacity of the mill is correspondingly increased. 2d, Providing the shell, G, with a guard which fits into a rebate in the upper part of case, D, so that shell G may be moved vertically at pleasure without the escape of the contents of the mill between the edges of said shell and case.

295. Socket for Tool Handles; William Bennett, City of New York.

Claim—A tapering socket made widest at the bottom or closed end, in combination with the wedge, B, constructed as described.

296. Cotton Seed Planters; Edward F. Bostrom, Newnan, Georgia.

Claim—The combination of the screw and shaft placed within the seed box, and provided with beaters.

297. Machines for Turning Selvages in Cloth; John Y. Boyd, Charlestown, Massachusetts.

Claim—A combination of one or more guiding ledges, bending or creasing roller, a shoe or turning cam, and one or more flattening or pressing rollers, applied together and to a table or bed. And in combination therewith, the press board, arranged with respect to the table and the said devices for turning and pressing the selvage of the cloth.

298. Rotary Sawing Machines; Harvey Brown, City of New York.

Claim—The arrangement of the hoop or band saw, operating vertically within a circular horizontal carriage with adjustable feed motion, by which there is a continuous motion of both saw and carriage, all operating in unison with reference to the desired end when in motion.

299. Coating Metallic Surfaces; Wm. and Wm. A. Butcher, Philadelphia, Pennsylvania.

Claim—The process of coating metallic surfaces, consisting of heating the metal to be coated to about 350° of heat, containing the mixture, prepared as described, and in placing the metal to be coated in a baking oven, heated to about 200° of heat, to harden the coating.

300. Pantographic Telegraph; Giovanni Caselli, Florence, Italy.

Claim—The mode of rapidly transmitting the fac similes of writings, drawings, ciphers, and arbitrary signs in colored characters, upon ordinary white or chemically prepared papers. Also, the mode of receiving and transmitting different despatches at the same time, and with a single wire. Also, the use of local piles, with circuit always closed, for the production of the characters in chemically prepared paper.

301. Sewing Machine; Samuel Comfort, Morrisville, Pennsylvania.

Claim—1st, The rocking frame as operated by the crank, P, with its concave shuttle race, in combination with the stationary shuttle. 2d, Imparting to the needle an upward and downward combined with a lateral vibrating movement, by means of the rocking frame and levers, operated by the crank. 3d, The vibrating concave shuttle race with its lips, in combination with the discoidal shuttle and adjustable retaining plate. 4th, Sustaining the needle in the slot of the shuttle race during the time that the said needle is, by its lateral motion, imparting the feed motion to the fabric.

302. Upsetting Tire; G. W. Cooper, Morenci, Michigan.

Claim—The jaws attached to rods which are provided with springs, and have a vertical movement as well as a rotating one, and the inclined planes in the plate below the jaws, the above parts being used in connexion with the stationary jaws, the jaws being applied to the ledges of the plates.

303. Mode of Obtaining Motive Power; Peter Daniel, Franklin County, Kentucky.

Claim—The arrangement of pulleys, 1 2 6 7, wheels, 3 4 5, lever, i, belt or cord, J, shafts, S and S′, and pulleys, K K, with the cords, F F′, weights, O O′, car, E, railroad, e, and the levers, B B, pulleys, P′ and £, cord, c, and wheel, M, when all are operated in the manner set forth.

304. Rolling Railroad Bars; Giles Edwards, Johnstown, Pennsylvania.

Claim—The manner described of arranging or disposing old rails in forming a "pile."

305. Apparatus for Skinning Eels; Adam Emeigh, Jerusalem, New York.

Claim—The holder or clamp formed of the frame, connected with a spring treadle and provided with spurs, and the knife, G, and leger blade, arranged relatively with each other, the above parts being fitted in, or attached to, a frame, and used in connexion with a griper T, and ripping knife K, or their equivalents.

306. Rotary Shingle Machine; R. Freeman, Fond du Lac, Wisconsin.

Claim—The horizontal rotating plate or carriage, circular saw, stationary and setting beds, and jaws, in connexion with the roller and arm.

307. Lathe for Turning Oval Frames; John William and George Gardener, City of New York.

Claim—Constructing oval picture frames by the application of the revolving cutters to the frame, when the latter is caused to revolve in an oval path, and when the cutters are so arranged as to act simultaneously, one cutter to form the inside, and the other cutter the outside moulding of the frame.

308. Electric Signal Lights; Samuel Gardiner, Jr., and Levi Blossom, City of New York.

Claim—The combination of a platinum coil, or its effective equivalent, which is illuminated by electricity, with a transparent signal lantern, said combination being effected by arranging the coil within the lantern upon two conducting wires, which are connected with an electro-galvanic battery.

309. Button Fastening; Lester Goodwin, City of New York.

Claim—Making one right-angled piece movable on its perpendicular leg in, and embraced by, a band to another right-angular piece, and depending upon it for support. And the controlling of the position of the movable right-angled piece by a spring, and the confining the spring obstructions on the surface swept by it, substantially confined as represented.

310. Pantaloons; Benjamin J. Greely, Springfield, Massachusetts.

Claim—Making up the back part of pants with a lapel and elastic straps instead of seaming them, as they have invariably been made; also the cutting of the top part or waistbands of pants, so as to be perfectly and pleasantly suspended at only two points.

311. Seed Planters; Richard B. Ground, Marine Town, Illinois.

Claim—The arrangement of the respective parts of the planting apparatus with the adjustable threefold frame work.

312. Ink Rollers; Alpheus A. Hanscom, Saco, Maine.

Claim—1st, The employment of the several parts specified, for the purpose of adapting the carriage to different sized forms. 2d, Suspending the ink roller in the rolling carriage, constructed in the manner set forth, and regulating and stationing said roller, by means of screws and nuts, for the purpose of making an adjustable hand roller for inking type.

313. Ring Clamps for Engravers, &c.; Thomas R. Hopkins, Petersburgh, Virginia.

Claim—The adjustable encircling spring, arranged in the end of the stock, and attached to an adjustable rod.

314. Cultivators; William A. Hopkins, Vicksburgh, Mississippi.

Claim—The arrangement of the beam, transverse beam, handles, bolts, shares, standards, and stays, when the several parts are constructed and united as described, and not otherwise.

315. Horse-shoes; William E. Hubbard, Randolph, New York.

Claim—The combination of the hooks, B, the screw nut, C, being condensed as a part thereof, with the stiff unyielding shoe, A

316. Type Case for Printers; Wm. A. Hunter, Bryan, Ohio.

Claim—Making the bottom of a type case of a metallic screen, or other perforated material. Also, the sliding shaft, in combination with the perforated bottom of a type case.

317. Screw Picket; Oliver Hyde, Benicia, California.

Claim—The application of a loose swivel to the top of a coarse threaded screw, in combination with a catch or lug under the head of the screw, so that in connexion the swivel becomes the lever to turn the screw into the ground.

318. Bank and other Locks; Wm. Johnson, Milwaukie, Wisconsin.

Claim—1st, Interposing between the key-hole of the lock and the racking stump or thrust plate of the bolt, centrally pivoted horizontal tumblers, which by the act of the key alone are brought into proper position to allow the unlocking movement of the bolt, when the key is withdrawn. 2d, So connecting the sliding bridge plate to the sliding guard plate that the latter shall move to bring its slot in line with the slot in the socket by the motions of the bridge plate, and allowing the bridge plate motion only when the key shall be withdrawn from the socket. 3d, Interposing between the horizontal tumblers and the pin or stud of the bridge plate, an angular lever. 4th, The arrangement of the bolt plate with the bridge plate and the guard plate in their relation to each other and the moving parts of the lock, so that while being overrated by the same means, they have different periods of motion.

319. Pipe Coupling; David Kahnweiler, Wilmington, North Carolina.

Claim—In swiveling elbow joints for pipes for conveying gas, steam, or water, I claim combining with the male section of the joint an axial stem or rod, which passes into and through the female section, said stem having upon its projection end a screw thread to receive a tightening nut, and the joints being provided with suitable washers.

320. Machines for Cleaning Daguerreotype Plates; Charles Ketcham, Pen Yan, New York.

Claim—Cleaners made as specified, with the projections as set forth; also, the means for holding them in position with respect to each other, and the means for giving motion to the cleaners, when arranged as specified.

321. Harvesters; William F. Ketchum, Buffalo, New York.

Claim—1st, The plate, E E, as a substitute for the usual main frame, placed mainly within the rim of a driving wheel whose hub and spokes or supporting plates are placed at the outside laterally of the rim. 2d, The internal zigzag groove, in combination with the rock shaft, with its arms for vibrating the cutters. 3d, Supporting the boxes for the main shaft and the rock shaft upon a plate, or its equivalent, placed mainly within the rim of the driving wheel.

322. Skirt Hoops; Martin Landenberger, Philadelphia, Pennsylvania.

Claim—Constructing hooped skirts of a knitted fabric with elastic hoops interlooped in the same.

323. Illuminating Covers for Vaults, &c.; Elijah P. Leonard and P. H. Jackson, City of New York.

Claim—1st, The use of a plate or plates of glass in vault covers, platforms, pavements, sidewalks, decks, or for similar purposes, which plate or plates are supported from below. 2d, Thimbles, pins, or their equivalents, passing through perforations in a plate of glass or plates of glass, and formed with, connected to, or resting on a suitable support beneath the plates of glass. 3d, Grooving or notching the edges of the plate of glass, for the purpose of receiving projections occupying said grooves or notches, and thus protecting the edges of the plate of glass from injury. 4th, The use of perforated plates of glass for pavements, sidewalks, decks, platforms, vault covers, &c.

324. Cans for Preserving Food, &c.; Azel Storrs Lyman, City of New York.

Claim—The employment of the float surrounded by the protecting liquid, in combination with a vessel having an arrangement for discharging its contents.

325. Bedstead; Norman Lamphear, Monmouth, Illinois.

Claim—The arrangement of those parts of a bedstead with each other which serve for stretching and securing permanent elasticity in the bottoms thereof.

326. Knife and Spoon Cleaner; James Macnish, Berlin, Wisconsin.

Claim—A machine combining three disks, the faces of which are adapted for cleaning large and small knives, and the periphery of one of the same for sharpening knives, and the peripheries of the other two for cleaning the front and back of spoons and forks.

327. Cartridges; G. W. Morse, Baton Rouge, Louisiana.

Claim—The tige secured in the cartridge case in either of the modes described, and all equivalents thereto, for the purpose mentioned. Also, the combination and arrangement of the percussion cap and perforated disk, as described.

328. Net for Catching Fish at Sea; Benjamin Merritt, Jr., Charlestown, Massachusetts.

Claim—Combining a seine or net with the hull of a navigable vessel. Also, the mode of spreading the ends and outer edge of the net, viz: by the booms, the sprits, and the hauling tackles, arranged and applied together and to the vessel, as specified. Also, the combination of the brailing line and the lifting tackles, with the net, its booms, and the masts.

329. Gauge Cock and Alarm Whistle; Alexander Miller, Cleveland, Ohio.

Claim—The described arrangement of the steam alarm whistle and gauge cock with the jointed lever, when constructed and operating in the manner set forth.

330. Hand Drill; H. H. Packer, Boston, Massachusetts.

Claim—The combination of the cylindrical shells with the feed screw and screw handle.

331. Vapor Lamps; William H. Racy, St. Augustine, Florida.

Claim—The employment or use of a tube and burner, arranged with a lamp or fountain, as shown, or in any way, so that the flame which is fed direct from the burning material within the fountain, may serve as gas generator to supply the illuminating flame that issues from the burner, and this I claim irrespective of any particular means which may be employed for supplying the illuminating flame with oxygen.

332. Churns; Alfred Rose, Pen Yan, New York.

Claim—The cam wheels, E E and F F, and the part, D, constructed and arrangnd in the manner represented.

333. Apparatus for Manufacturing White Lead; R. Rowland, City of New York.

Claim—The combined manufacture of vinegar and white lead, and for the purpose of carrying on both simultaneously and without injury to the one or the other, namely, fitting the tops of vinegar vats (when said vats are placed in a room below the corroding room,) to the floor of the corroding room, in combination with covers provided with openings and valves, or any equivalent means for regulating the supply of acid, or altogether closing up the communication between the interior of the vats and the corroding room whenever necessary.

334. Washing Machine; Perry C. Rude, Morgantown, Virginia.

Claim—In combination with the plunger, the concave rack formed of stationary ribs and hinged ones, so that the water behind the rack shall be jeted through the openings in the stationary ribs into the clothes.

335. Cooking Stoves; Silas T. Savage, Albany, New York.

Claim—The arrangement of air tubes across the main flue of a cooking stove, for the purpose of receiving and transmitting the caloric of the fuel to the walls of an oven by a current of heated air.

336. Grinding Mills; William Scarlett, Kenosha, Wisconsin.

Claim—1st, The combination of the screw-rod, thimble, and separated hubs, in the particular manner shown. 2d, The arrangement of the conical feed plate in the bottom of the hopper loosely over the central box of the central screw, and so as to be adjusted vertically by means of set-screws, independently of the crushing and grinding devices. 3d, The arrangement of the cutters, g, so that their vertical edge shall only nearly touch the horizontal edge of the cutter, s, and thus ensure the crushing of the corn, &c., between the same at a point near the centre of the mill.

337. Grain Separators; H. H. Seeley and Philander Griswold, Hudson, Michigan.

Claim—Forming the fan box of two parts, and the fan made also of two parts, so as to have one portion of the fan for each compartment of the box, and having the slides attached to the box, to regulate the admission of air into the opening between the parts of the fan box.

338. Fire and Burglar Proof Safes; Theodore Sharts, Albany, New York.

Claim—A fire and burglar proof sectional cast iron safe, which has the junction between its sections accomplished by means of tongues and grooves, and maintained by means of screw rods which have their ends entirely hid from sight and inaccessible to burglars when the safe is finished, by flowing melted metal over and around the same.

339. Stave Machine; Wm. M. Sloane, Buffalo, New York.

Claim—1st, Operating the two rotary cutters in a vertically moving frame. 2d, The arrangement of the cutters relatively to the revolving bed, former, and feed rollers. 3d, The cam, when constructed according to the formula, and used for the purpose as set forth.

340. Seed Planters; George Smith and A. G. Perry, Clyde, Ohio.

Claim—The shaft and spring, adjustable spring box, pulley, lever, seeding cylinder, hopper, and the cultivator, when the whole are arranged conjointly in the manner set forth.

341. Sewing Machines; E. Harry Smith, City of New York.

Claim—Revolving the shuttle by means of a series of drivers on the surface of a disk that is arranged to rotate at an angle to the plane of the shuttle's rotation, by which a continuous motion is given to the shuttle, while the drivers operate in such a manner that the needle and its thread are unobstructed in their action.

342. Churn; William H. Tambling, Berlin, Wisconsin.

Claim—Arranging a skeleton semi-sphere on the upper side of the upper dasher, of reverse acting or forward and back acting churns.

343. Fountain Pens; Susan E. Taylor, East Cambridge, Massachusetts.

Claim—An improved fountain pen, made with a pen-holder and a separate adjustable fountain, applied so as to be movable with the holder. Also, when the tubular reservoir is provided with a piston, as described, arranging a small air hole through the side of the reservoir, so that the piston, besides being able to perform the office of elevating the ink into the fountain, may be made to cover the air hole more or less, and to operate as a valve to it.

344. Sewing Machines; John Thomson, Worcester, Massachusetts.

Claim—The spreading finger, acting between the bed of the machine and the looper that carries the second thread in such a manner that both enter the loop of needle thread, and then the spreader extends the loop of second thread as it draws from the eye of the looper to the cloth.

345. Brad Punch; John Thorndike, North Weare, New Hampshire.

Claim—The cylinder provided with the rod, B, punch, A, and rod, F, the rod, B, having a spiral spring placed around it, the above parts being used in connexion with the reserve box, placed relatively with the cylinder.

346. Propeller; William Thurber, Olean, New York.

Claim—The falling face of the blade, in combination with the rear inclined surface and the filling on the back of the blade.

347. Machine for Re-sawing Lumber; E. H. Titus, Wilkesbarre, and John Sharp, Phillipsburgh, Penna.

Claim—The tilting frame provided with feed and pressure rollers, and also with the planer and jointing cutters, if desired, the frame being applied to the machine.

348. Burning Fluid Lamps; Hiram Todd, Columbus, Ohio.

I do not claim the application of a water chamber around the wick tubes of lamps, to apply water to the wick to extinguish the light, or any such device.

Claim—The arrangement of the water chamber with the tubes, B C, and wick tube, I. Also, the arrangement of the safety valve, F, and tube, E, with the wick tube, I.

349. Cotton Gins; J. Alexander Ventress, Woodville, Mississippi.

Claim—In combination with the ribs set close up to the saws, forming a clear space between the ribs at that point where the teeth of the saw carries the cotton through them, to prevent said cotton from being brought in contact with said ribs.

350. Method of Fastening the Wick Tubes of Lamp Caps; William W. Wade, Longmeadow, Mass.

Claim—The method of fastening the wick tube and spindle for raising and depressing the wick in lamp attachments, without the use of solder.

351. Seed Planters; Augustus Wales, Pontiac, Illinois.

Claim—The arrangement of the two cranks to the wheel, the pitmans, the levers, and rollers, with gates provided with slides.

352. Bedstead; C. A. Warner, Bristol, Connecticut.

Claim—The arrangement of the staples and pins, pulleys, spindle, ratchet, and pawl, in the manner described.

353. Attaching and Houseing Propellers; William Webster, Jefferson County, Washington Territory.

Claim—1st, The sliding ports (of any shape required by the form of hull and propellers,) and connected apparatus by which they are operated for covering and uncovering the propellers, in combination with the trunk and trap hatch. 2d, The pipe leading from the propeller chamber to the pump well. 3d, The mode of attaching and detaching the after propeller blades, in combination with the slide ports and propeller chambers. 4th, The air chambers in the bow and stern, as arranged relatively to the propeller recesses or chambers.

354. Fire Ladders; Joseph Welte, Buffalo, New York.

I do not claim the ladders described, nor their combination, nor the extension thereof, by any means. Neither do I claim hinging the ladders to the carriage.

Claim—The combination of the right angled levers (hinged to the carriage) with the frame and windlass, for the purpose of elevating the ladders and lowering the foot thereby easily to the ground, and for detaching the same from the carriage. Also, the combination of the right angled frame, including the wheels, with the topmost ladder

355. Sewing Machines; H. B. West and H. F. Wilson, Elyria, Ohio.

Claim—The spring looper bar, in combination with the eccentric and the oscillating fork and stationary projection, against which the outer end of the looper bar strikes, for the purpose of carrying the looper bar back and forth as required, and giving it two intermittents or stop motions, carrying the looper into a position where the needle will pass through it, and allowing the spring again to recoil immediately after the needle has passed through said loop.

356. Use of Dentists' Pattern Plates; William M. Wright, Pittsburgh, Pennsylvania.

Claim—The use of metallic pattern plates, or their equivalents, made as described.

357. Obtaining Pure Sulphurous Acid; Joseph Albrecht, Assignor to Charles E. Rulh, New Orleans, La.

Claim—The described process for the purification of sulphurous acid gas by absorbing the acid into water or an alkaline solution, and the subsequent expulsion therefrom by the use of heat or steam.

358. Ore Separator; Hezekiah Bradford, Assignor to Horatio Bogert, City of New York.

Claim—Making the sieve box, which has an up and down motion, with apertures above the sieve, or the equivalent thereof, when acting in, and in combination with, water or a surrounding tank or trough. Also, in combination therewith, the partition, or its equivalent, in the water tank, to keep the matter which is washed over separate from the substances which pass through the meshes of the sieve. Also, covering the surface of the sieve with particles of matter of larger size than the meshes of the sieve, that they may lay on and not enter or pass through such meshes, but act as valves to such meshes, when such mode of operation is to be employed for separating substances of different specific gravity, which have been prepared and assorted so as to be of less size than the meshes of the sieve, that they may pass through such meshes freely.

359. Double-acting Gun Lock; Eliash Brey, Assignor to self and J. S. Swartley, Pennsburg, Pennsylvania.

Claim—The swivel hammer, in combination with the centre swell pin, or its equivalent.

360. Converting Peat into Charcoal; J. Burrows Hyde, Assignor to Anna M. Hyde, City of New York.

Claim—The process described of converting peaty matters into charcoal, by previously submitting them to heat in a drying chamber, described and heated as set forth, and by carbonizing the material and subsequently cooling the same.

361. Sash Fastener; Solomon Carhart and William Moore, Brooklyn, New York, Assignors to James H. McWilliams, City of New York.

Claim—The hinged drop and plate attached to the lower sash, in combination with the plate attached to the upper sash, when said drop is kept beneath the edge of the plate by means of the bolt or its equivalent.

362. Apparatus for Rectifying; Ethan Campbell, Assignor to Henry Thayer, Cambridgeport, Mass.

Claim—The general combination of the different parts, with the attachment of the air pump, so as to produce the effect desired. Also, combining with the rectifying columns the vertical discharge pipe and the series of horizontal pipes which connect it with the column.

363 Sewing Machines; Thomas A. Dugdale, Assignor to self and John A. Burbank, Richmond, Indiana.

Claim—The construction of lever, I, with its circle at the end, through which upright, F, works, in combination with stud and slot, and eccentric and feed hand, the whole being constructed as described.

364. Device for Securing Cutters in Rotary Planing Machines; Sands F. Forman, Assignor to Henry Z. Drew, City of New York.

Claim—Securing a beading or rebating cutter into a slot in the stock of a planing machine cylinder by

pressure from the straight cutter or knife, and from a screw running nearly parallel with the axis of the rotary cutter.

365. Sewing Machines; Westley Miller, Cambridge, New York, Assignor to self and William P. Prescott, City of New York.

Claim—The hooked heel piece and straight side on the looper stock, in combination with the finger having a reciprocating motion on the slide, whereby the necessary motions for taking a loop pausing during the ascent and commencement of the descent of the needle thread are given from the continuously reciprocating finger, h, without the use of springs.

366. Quilting Frame; John King, Assignor to self, Wm. Hegbie, Henry Link, and G. R. Comstock, Little Falls, New York.

Claim—The arrangement of the shafts and connecting bar, operating as described.

367. Drawing Rollers; S. P. Spencer, Assignor to self, S. S. Spencer, and H. Boardman, Lancaster, Pa.

Claim—Providing the lower roller with grooves, and the upper roller with leather collars, the said collars being arranged to run into the grooves.

368. Revolving Fire Arms; F. D. Newbury, Assignor to R. V. De Witt, Jr., Albany, New York.

Claim—1st, The trigger, for the purpose of cocking the hammer, revolving the cylinder, holding the cylinder in the act of firing, and firing the piece. 2d, The combination of hammer, its pin, the trigger, and the ratchet wheel.

369. Apparatus for Heating Tires; J. J. White, Assignor to self and Francis Fox, Philadelphia, Penna.

Claim—The casting with its revolving grate and lid, in combination with the fire chamber and fan, or other equivalent blowing apparatus, when the whole are arranged for joint operation.

370. Valve Gearing for Steam Engines; J. F. Allen, City of New York.

I do not claim the use of a sliding toe, like g, applied to the arm of the valve rock shaft.

Claim—The arrangement of the swinging plate or open arm with its two-pointed swinging piece, or equivalent, in combination with the single rock shaft, its arm and movable toe, to operate the two induction valves.

371. Railroad Car Brakes; H. M. Collier, Binghampton, New York.

Claim—The arrangement and combination of the rock shaft with the spring and the axle boxes.

Extension.

1. India Rubber Fabrics; Chas. Goodyear, New Haven, Connecticut; patented June 15, 1844; re-issued Dec. 25, 1849, in two separate patents; being Nos. 156 and 157; extended June 22, 1858.

No. 156. Processes for the Manufacture of India Rubber.

Claim—The curing of caoutchouc or india rubber, by subjecting it to the action of a high degree of artificial heat. Also, the preparing and curing the compound of india rubber, sulphur, and a carbonate of other salt or oxide of lead, by subjecting the same to the action of artificial heat.

No. 157. Felting India Rubber with Cotton Fibre.

Claim—Incorporating the fibres of cotton, or other substance, with india rubber, by preparing the fibres of a fleece or bat of cotton, or other fibrous substance, into a sheet of india rubber in the green state, without subjecting the fibres, after they have been incorporated, to a stretching or drawing operation.

Additional Improvements.

1. Rotary Blast-producing Chair; Leopold R. Breisach, City of New York; patented February 16, 1858; additional dated June 1, 1858.

Claim—The arrangement of the two bellows, one of which is on the front and the other on the back part of the rocking chair, and the use of the S-formed levers placed parallel to the rockers.

2. Polishing Apparatus for Watchmakers' Lathes; J. M. Bottum, City of New York; patented March 13, 1855; additional dated June 8, 1858.

Claim—The construction and arrangement of the polishing apparatus combined with the parts claimed in my former patent.

3. Tightening the Tires of Carriage Wheels; R. R. Scott, Philadelphia, Pennsylvania; patented March 23, 1858; additional dated June 8, 1858.

Claim—Disclaiming the exclusive use of two sets of taper keys for drawing together the two ends of the tire, I claim the ends, B and C, of the tire, with their respective slotted blocks, b and c, the taper keys, and the bolt, G, when arranged for joint operation.

4. Shingle Machine; Elbridge Webber, Gardiner, Maine; patented July 28, 1857; additional dated June 15, 1858.

Claim—The levers, L and L′, as described, and the detents, D and E, in combination with notched piece, O, trip, R, and laterally adjustable trip piece, H.

Re-Issues.

1. Mode of Connecting the Steam Cylinder with Steam Chests; Frederick E. Sickles, City of New York; patented September 19, 1845; re-issued June 1, 1858.

Claim—So constructing balance puppet valve engine steam chests, that a portion of the outside of the cylinder forms a portion of the inside of the chest, having the plates which contain the upper and lower valve seats cast directly upon the cylinder, thus dispensing with the nozzle and nozzle flanches, and saving steam heretofore lost by reason of their interposition between the chest and cylinder.

2. Electro-Magnetic Alarms; A. R. Pope, Somerville, Massachusetts; patented June 21, 1853; re-issued June 8, 1858.

Claim—1st, The mode of breaking and completing the circuit, or vice versa, that is, by the spring circuit breaker operating to cause the vibration of the armature. 2d, So combining a hammer and bell with the self-vibrating armature, that the vibrations of the latter shall produce a continued ringing of the bell under circumstances as described. 3d, The combination of these parts, namely, the circnit breaker, hammer, bell,

and vibrating armature, or their equivalent or equivalents, with a self-acting spring or key in a door or window, to operate so as not only to bring them automatically into action when the door or window is open, but maintain a continuous or continued ringing of the bell by the interruption of the electric current without the intervention of other machines.

3. SEWING MACHINES; Charles A. Durgan, City of New York; patented May 22, 1855: re-issued June 15, 1858.

Claim—1st, The vibrating hook, or its mechanical equivalent, for holding down the thread during the partial passage of the shuttle through the loop, when arranged as set forth. 2d, In combination with the vibrating hook, or its equivalent, the employment of two continuous rotary motions, one working the needle, the other the shuttle, and this for the purpose of producing sewing without any rest on either the shuttle or needle in their movements, thereby rendering a sewing machine capable of rapid action, simple in construction, and noiseless in its operation.

4. SEWING MACHINES; Wm. O. Grover and Wm. E. Baker, Assignor to the Grover and Baker Sewing Machine Co., Boston, Massachusetts; patented February 11, 1851; re-issued June 15, 1858.

Claim—Only the combination of these three elements, namely:—1st, A mechanism for making a stitch substantially such as is described, and consisting of an eye-pointed perforating instrument and a non-perforating eye-pointed instrument. 2d, A stationary table or support for the material to be sewed. 3d, A feed in which the cloth is grasped between two surfaces without being attached to either of them, meaning to claim as of our invention none of these elements, severally or apart, from the others, but only the three in combination.

5. EXTRACTING STUMPS; Wm. W. Willis, Orange, Massachusetts; patented March 6, 1855; re-issued June 22, 1858.

Claim—The combination of the draft hook, R, shears, H, and pulley, N, substantially in the manner and for the purpose set forth. Also, the application and arrangement of the links, or their equivalents, in combination with the lever, so that the said links may alternately be put into connexion with the draft chain, by means of the two link hooks, or their equivalents

DESIGNS.

1. AQUARIUMS; A. L. Blanchard, Albany, New York; dated June 1, 1858.
2. FONT OF TYPES; James Connor, City of New York; dated June 1, 1858.
3. COOK STOVES; E. J. Delaney and J. Martino, Assignors to W. P. Cresson, D Stuart, and R. Peterson, Philadelphia, Pennsylvania; dated June 1, 1858.
4. ORNAMENT IN BAS-RELIEF FOR STOVES, &c.; George F. Seavey, Boston, Massachusetts; dated June 1, 1858.
5. SEWING MACHINE STANDS; James Wilcox, Philadelphia, Pennsylvania; dated June 1, 1858.
6. STOVE DOORS; R. H. N. Bates, Providence, Rhode Island, Assignor to self, Isaac Backers, Canterbury, Connecticut, and J. P. Barstow; dated June 8, 1858.
7. PRINTERS' TYPES; George Bruce, City of New York; dated June 15, 1858.
8. STOVE PLATE; S. W. Gibbs, Albany, New York; dated June 22, 1858.
9. STOVES; James Horton, Assignor to David Stuart and Richard Peterson, Philadelphia, Pennsylvania; dated June 29, 1858.
10. STOVES; Joseph A. Reed, Assignor to David Stuart and Richard Peterson, Philadelphia, Pennsylvania; dated June 29, 1858.
11. COOKING STOVES; G Smith and H. Brown, Assignors to Leibrandt, McDowell & Co., Philadelphia, Pennsylvania; dated June 29, 1858.
12. COOKING STOVES; G. Smith and H. Brown, Assignors to Leibrandt, McDowell & Co., Philadelphia, Pennsylvania; dated June 29, 1858.

ABSTRACTS OF SPECIFICATIONS OF RECENT PATENTS.

FROM H. HOWSON'S PATENT AGENCY, PHILADELPHIA.

For the Journal of the Franklin Institute.

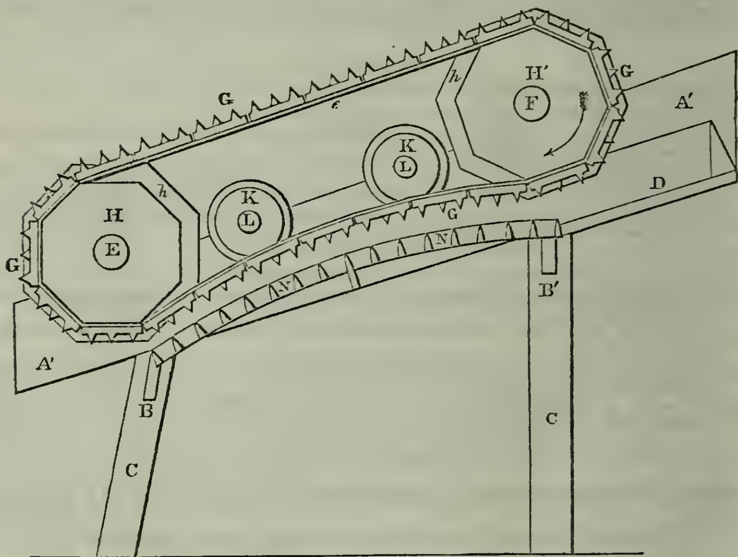
Improvement in Corn Shellers. Patent granted to AUGUSTUS B. DAVIS, April 13, 1858.

This invention consists in combining an endless band or chain of toothed plates with an angular barred grating, in the manner fully set forth hereafter, for the purpose of stripping the kernels from ears of corn in a rapid and effectual manner.

The annexed cut represents a sectional elevation of this improved corn sheller.

The frame work of the machine consists of two side pieces (one of which, A′, is shown in the engraving), the transverse bars, B and B′, and the legs, C′. In front of the machine and between the side pieces is a shelf, D, for receiving the ears of corn. Two shafts, E and F, are

hung in suitable boxes, secured to the opposite side pieces, and on these shafts are secured the pulleys, H and H′, two on each shaft. A series of metal plates, G G G, furnished with pointed teeth and secured to the endless band, *e*, in close proximity to each other, pass over the pulleys, H and H′, these plates being maintained in their proper position laterally by flanches, *h*, on the pulleys. The latter are octangular or have any convenient number of sides, providing each side is as long as the plates, G, are wide. The endless band of toothed plates is caused to assume the arched form shown in the drawing, by means of strips secured between the side pieces, which cause the plates to bear against the rollers, K K, revolving on the spindles, L L, the latter turning in the opposite side pieces, and being pressed down by means of springs, one of which is situated on each side of the machine. N, is an arched grating secured to the frame of the machine, and having two sets of



angular bars with sharp upper edges, one set being placed at a contrary angle to that of the other. This grating is so situated as to be in closer proximity to the toothed plates at the back of the machine than in front.

Instead of securing the toothed plates to an endless band, it is proposed, in some instances, to hinge them together so as to form of themselves an endless chain.

The ears of corn are placed on the shelf, D, down which they slide until caught by the traversing plates, G, which draw them over the grating, N. The ears, having a tendency to traverse the grate at the same angle as the bars, must roll over from side to side, and, during their course over the grating, must be submitted to the action of the toothed plates, which effectually strip the kernels from the cob. Thus an ear, presented to the machine at the shelf, D, will roll over, follow-

ing the bars as a guide until it arrives at a point half-way over the grating. From this point the bars are placed at a reverse angle, which the ear follows with a rolling motion until it makes its exit at the back of the machine, entirely deprived of its kernels by the plates, G, which have been moving rapidly in a direct course during the retarded and tortuous passage of the ear. As the space between the endless chain of plates and the grating is curved, it will be evident that the point of the ear must be as effectually stripped of its kernels as the body.

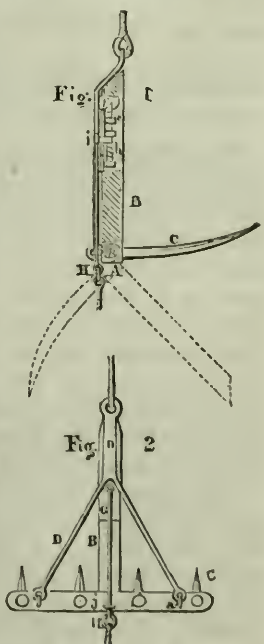
Improvements in Hay Elevators. Patent granted to E. M. Rees, August 10, 1858.

This invention relates to an improvement in hay elevators, in which the frame with its teeth is so connected to an elevating rod, that a load of hay may be retained and released at pleasure; and the improvement consists in a peculiar construction of an elevating bar, spring bolt, and rod for operating the same, and in the manner of combining these with, and arranging them on, the frame, as fully described hereafter, the whole forming a substantial, compact, and efficient hay elevator, and one easily operated and free from the defects of other hay elevators.

In the annexed engraving, fig. 1, is a sectional view of my improved hay elevator.

Fig. 2, a back view of the same.

The frame work of the elevator consists of two substantial beams, A and B, the latter being secured midway between the ends, and at right angles to the former. To the front of the beam, A, are secured the four curved teeth, C', and to the back, near each end of the beam, the two staples, *a*, to each of which is connected one of the arms of the forked elevating rod, D, the upper end of which is furnished with an eye for connexion to the elevating rope or chain. An oblong opening, *b*, is cut through the beam, B, for the reception of the spring bolt, which is arranged to slide in projections, *e*, on the inside of the plate, G, the latter being secured to the back of the beam, B. This spring bolt has a pointed end, adapted to fit into an angular recess formed in the underside of a block, *f*, which is attached to the elevating rod, D, and which projects through an opening in the plate, G, into the oblong opening, *b*, in the beam, B. A spiral spring coiled round the lower portion of the bolt, F, and intervening between a projection, *i*, on the said bolt, and the lower projection, *e*, on the plate, G, serves to maintain the point of the said bolt within the recess of the block, *f*, when not withdrawn by depressing the rod, H, the upper end



of which is connected to the projection, *i*, the lower end sliding in a staple attached to the beam, A, and being furnished with an eye and link for connexion to a cord or chain.

It will be seen on reference to fig. 1, that the upper end of the elevating rod, D, is bent towards the front of the machine, and that the upper end of the beam, B, is cut away so as to be adapted to this bend, the object of which is to maintain the beam, B, as nearly in a perpendicular position as possible, when suspended to the elevating rope or chain.

As seen in fig. 1, the implement is in the act of raising its load of hay. When the required altitude has been reached, one of the attendants pulls the cord attached to the end of the rod, H, depressing the spring bolt until its point leaves the notch in the blocks, *f*, when the frame, with its teeth, its bolt and rod, for operating the same, fall and assume the position shown in dotted lines (fig. 1), thereby discharging its elevated load, the rod, D, remaining suspended in its original position.

The frame is now raised towards its original position, and the beveled edge of the bolt striking against the rounded end of the projection, *f*, the bolt is depressed until its point coincides with, and is forced by, the spring into the recess of the block, when the frame and elevating rod become locked together as before, prior to the elevation of another load of hay.

MECHANICS, PHYSICS, AND CHEMISTRY.

Specification of the Patent granted to HENRY MEDLOCK, *for an Improved Method of Purifying Water.**—Dated January 21, 1857.

To all whom these presents shall come, &c., &c.—The said invention consists of a method of purifying and rendering more wholesome and useful water which either contains in solution only organic matter or the products of its decomposition, or which may also contain in solution inorganic matter, by separating and removing from the water a portion of such organic matter, and rendering the remainder of such organic matter inocuous; and in case the water also contains in solution inorganic matter, by separating and removing from the water a certain portion of such inorganic matter, and by rendering inocuous any phosphides or sulphides which the water may contain in solution, by converting such phosphides into phosphites or phosphates, and such sulphides into sulphites or sulphates respectively.

The manner of performing the said invention is to place the water previously to its filtration in a vessel or reservoir of convenient size, and there to allow it to remain in contact with certain solid bodies of metal or other substance presenting a sufficient extent of surface in contact with the water for twenty-four hours or longer, according to the quantity of water as compared with the extent of surface presented to the water by such bodies, or until the precipitation of organic matter

* From the Repertory of Patent Inventions, Oct., 1857.

occasioned by such contact ceases, after which any of the precipitate occasioned by the aforesaid process which may remain suspended in the water should be removed from the water by subjecting the water to filtration in the ordinary manner.

The solid bodies which I prefer to use for the above purpose are metallic bodies, and the metal I prefer to use for the above purpose is iron, on account of the little injury the water sustains by the use of it. And I prefer to use the iron in the form of scrap iron, iron turnings, iron wire, or sheet iron, though iron in any form presenting a sufficient surface in contact with the water will tend to the same result.

The following I find to be a convenient method of applying my aforesaid invention:—I suspend in a tank or reservoir containing the water to be purified, by means of iron rods passing across it, iron wire of about one-sixteenth of an inch in diameter loosely packed in bundles or coils, and in the proportion of about one pound weight of such wire to every one hundred gallons of water. I allow the water to remain in contact with the iron wire from twenty-four to forty-eight hours, according to the rapidity with which the precipitation of organic matter occasioned by such contact takes place, and I then pass the water through any kind of filtering medium now in use which is capable of retaining the precipitate formed. For the filtration of water in large bulk, I have found the ordinary sand filter sufficient. The effect of the contact of the water with the solid bodies above described, when the water contains nitrogen in any form, is to decompose or oxidize the organic matter and the ammonia contained in the water, whereby a certain part of the organic matter and ammonia is converted into nitrous or nitric acids, or both of them, by which the rest of the organic matter is rendered insoluble. The nitrous and nitric acids finally combine with the iron or other solid bodies above described, or with some of the inorganic bases, if any, contained in the water, and the organic matter rendered insoluble is precipitated together with some part of the inorganic matter, if any, contained in the water. And any phosphides or sulphides which may be contained in the water are converted by oxidation into phosphites or phosphates, or sulphites or sulphates respectively, which are comparatively harmless.

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*On the Protection of Wood from Fire.**

A series of experiments has recently been made, on a small scale, at Portsmouth Dockyard, before the Admiral Superintendent, the Master Shipwright, the Superintendent Director of Works, the Director of Police, &c., at the suggestion of Mr. Hay, the Admiralty Chemist of the Establishment, who proposes to pay the beams and bulkheads of ships, before they are painted or whitewashed, with a composition consisting chiefly of silicate of soda, for the purpose of checking the spread of fire in the event of accident. The prime merit of the proposal belongs to Mr. Abel, the talented and experienced chemist of the War

* From the London Mechanics' Magazine, December, 1857.

Department, who has given much attention to the subject. At the same time it is due to Mr. Hay to say that, as the chemical officer of the Board of Admiralty, he has strenuously seconded the proposals of Mr. Abel, and has demonstrated by practical experiment the immense advantages which would result from the preparation of ship timber in the manner proposed. We have tested specimens of the wood prepared with the aforesaid silicate, and find the action of fire upon it much impeded by the treatment to which it has been subjected. In circumstances in which unprepared wood rapidly fires and burns away in a strong flame, the prepared wood slowly smoulders, with very little flame indeed, leaving a much denser charcoal than the other. The cause appears to be that the silicate, instead of becoming volatilized, fuses, and clings to the wood, cutting off the atmosphere from it; so that wood which, if unprepared, would lead flame rapidly along it, and thus spread the fire abroad, will, when prepared, confine, or greatly tend to confine, the fire to the spot at which it commences.

In order to bring this subject more fully before our readers, we give the following paper, prepared by Mr. Abel for the "Professional Papers" of the Corps of Royal Engineers, together with an extract from a report on experiments made at Chatham, from Colonel Sandham, R. E., and Mr. Abel, to the Inspector-General of Fortifications.

REMARKS ON THE PROTECTION OF WOOD FROM FIRE, BY F. A. ABEL, ESQ., CHEMIST TO THE WAR DEPARTMENT.

The attention of practical men has been for some years past directed, from time to time, to the importance of affording to wooden erections some degree of protection from the effects of fire; and numerous plans have been proposed, and to some extent tested, for lessening the combustibility of wood, and for covering its surface with a protective coating more or less unalterable by fire.

The simple application of lime or clay-wash, for example, has been found to afford some slight protection to wood, although the tendency of such materials to peel off the surface of the wood (into which they do not in any way penetrate), by exposure to heat, and the rapidity with which the coating is destroyed by atmospheric influence, render them very ineffective agents.

Several processes have been patented, even recently, for the protection of wood from fire. Some idea of the general nature of such processes will be conveyed by the following extract from an official report made on this subject:

"The importance of obtaining an effective method of reducing the combustibility of wood, or even of protecting its surface from fire, has led to an examination into some of the methods of accomplishing this, which have been lately patented, and of the general nature of which the following is a brief statement:

I.—"*Mr. Maugham's Patent* consists in saturating dried wood with an aqueous solution of phosphate of soda and muriate or sulphate of ammonia, in certain proportions.

"It is believed by the patentee that these salts will be so affected by

each other, and by the action of heat, that the fibres of the wood will be protected by an incombustible coating, while a quantity of vapor will be generated by the volatilization, and partial decomposition, of the ammoniacal salts, which will possess the power of extinguishing flame.

"The same objects are believed to be obtained by—

II.—"*Lieutenant Jackson's Patent Process*, by which wood is impregnated with a solution of salts of zinc and of ammonia.

"The same means are adopted in both of these processes for saturating the wood.

"It is packed into large cylinders, from which the air is then exhausted, the liquid being afterwards forced in with a pressure of 150 to 200 lbs., which is maintained during one or two hours. It is the same method as that employed in patent processes for preserving timber from decay.

"I am not aware whether Mr. Maugham's process has been submitted to any extensive practical test. Numerous experiments were, however, instituted on Lieutenant Jackson's process, under the direction of Mr. Brunel.

"Specimens of seventeen different kinds of wood were prepared; corresponding pieces being kept unprepared, and others covered with a coating of paint. Their powers of resisting fire were tested by piling the prepared, unprepared, and painted specimens round a perforated sheet iron surface, filled to the top with a bright coke fire.

"In most cases the prepared wood resisted the action of fire for a longer period, and, when removed from the fire, ceased burning sooner than the unprepared specimens.

"It was also evident that light porous woods were more efficiently protected than those of a denser character.

"There is no doubt, therefore, that the combustibility of wood is more or less diminished by either of the above methods of treatment, although the protective action must be ascribed to the indestructible compounds with which the wood is to some extent impregnated, far more than to the vapors evolved by the decomposition of the small quantities of ammoniacal salts forced into the wood.

"Although by the impregnating process adopted in the above patents the preparative solution is believed to be forced into the very centre of the wood, it is essential, if such a result is to be obtained, that the solution should be weak, since it is impossible to force strong saline solutions thoroughly into wood.

"It is evident that the protective action of the salt cannot, under these circumstances, be very powerful.

"Were it possible, on the other hand, to employ stronger solutions, the expense of the processes would be considerable.

"The necessity of costly apparatus for impregnating the wood is also a matter of serious moment."

The patentees of some of the wood-preserving processes go so far as to state that they are enabled to render wood incombustible or uninflammable, and such statements have tended to lead to the presumption

that a thoroughly effective protecting agent should have the power of depriving wood of its combustibility.

It will be readily understood, however, that even if a piece of wood could be most thoroughly impregnated with a solution of some strength, of matter unalterable, or at any rate only fusible by continued exposure to heat, the amount of protective material thus deposited in the pores of the wood, although it might be considered to surround each particle of fibre, would not prevent the destructive distillation of the wood by the effect of heat, the result of which would be the disengagement of inflammable vapors from the wood, and its ultimate complete ignition, if maintained for a sufficient period in the vicinity of highly heated or burning matter; or if, on the other hand, the protective agent employed be convertible by heat into vapors possessing the property of extinguishing such fire as they may completely surround, such vapors might have the effect of partially or completely extinguishing the fire in a piece of ignited wood, *after* its removal from the source of heat or fire, but otherwise the volume of vapor generated from the preparation used would be but slight, as compared with the inflammable vapors evolved from the overheated wood, and would have no perceptible effect on the combustion of these, while the scorched or charred woody fibre would be less efficiently shielded from the effect of flame, than by the coating formed from an indestructible preparation.

It does not therefore appear reasonable to expect more from the most efficient protective coating or impregnating material than—

1st. That it should considerably retard the ignition of wood exposed for some length of time to the effect of a high temperature; or of burning matter in its immediate vicinity.

2d. That if the vapors which the wood will emit, by continued exposure to heat, become ignited, the flames thus produced shall not readily affect the fibre of the wood, and shall cease almost directly on the removal of the wood from the source of heat; and

3d. That prepared surfaces of wood, when in actual contact with burning unprepared wood, shall have little tendency to ignite, and thereby cause the fire to spread.

In addition to such processes as those above referred to, in which the protecting material is forced into the wood by the application of considerable pressure, trials have been made with agents of different kinds, in solutions or baths, in which the wood was steeped or allowed to soak for some hours, so that it might be in a slight degree impregnated with the material, or that a superficial coating of the protective might at least be formed.

Some of these methods have been made the subject of experiments by order of Lord Panmure, with a view to test their merits.

One, proposed by W. C. Salomons, of Paris, consisted in immersing the dried wood alternately in two baths, the one containing three parts of acid sulphate of alumina, and one part of glue, dissolved in six parts of water; the other consisting of two parts of dry chloride of calcium, one part of glue, and seven parts of water.

The objects which the inventor wishes to attain by the use of these

solutions are, firstly, to impregnate the wood slightly with one of the salts (the chloride of calcium, for example), and then, by immersion of the wood in the second bath, to effect the decomposition of the first salt by the second in the pores of the wood.

Thus the chloride of calcium and sulphate of alumina should become converted into sulphate of lime and chloride of aluminum; the former an almost insoluble substance, the latter a soluble deliquescent body, possessing the property of converting the glue employed, together with the salts, into an insoluble body—a species of leather.

The pores of the wooden surfaces are, therefore, by the treatment in question, to be filled up by particles of a substance nearly insoluble, and unalterable by heat, which, together with the soluble salt, also present, are to be protected and united by means of the precipitated glue, which dries up to a hard horny substance.

The experiments made by this process showed that the glue employed in the solutions greatly impeded the penetration of the wood by the saline matter, and also caused the decomposition of the salts to be very partial.

The protective property of the coating formed on the wood, prepared by this process, was not found to be considerable, while the expense of the materials was great, as compared with others equally efficient.

The successful results obtained on the Continent by the application of alkaline silicates as protective materials, led to an examination into the comparative value of the cheapest of these, the soluble silicate of soda, as an agent for decreasing the combustibility of wood.

The property possessed by the soluble alkaline silicates, of being readily softened by hot water, and thus converted into a state of solution, while they are but slightly affected by cold water, renders their application to wood, either in the form of a bath, or as a wash, very simple. Their dilute solutions being readily absorbed by wood, the surfaces of the latter, as it dries, assume the form of a hard coating.

The experiments made in the first instance with the silicate of soda, and the results obtained, are described in the following extract from the official report:

"Various specimens of dry wood were prepared with silicate of soda, by being soaked for a few hours with a weak solution.

"Upon examining the interior of these, after the removal from the bath and subsequent dessication, the silica was found to have penetrated about a quarter of an inch on all sides.

"On piling the above over a fire, together with specimens of unprepared wood, and others that had been prepared by different processes, the superiority of the silicate of soda, as a protective agent, was fully established.

"Some specimens of wood were then simply painted with a moderately strong solution of silicate, and afterwards placed, together with unprepared wood, in a pool of coal-tar naphtha, some of the latter being thrown over the surfaces of the wood.

"Immediately on the ignition of the naphtha, the wood was surrounded by flames, which soon fired the unprepared pieces, whilst those

coated with the silicate only ignited after a time at the edge, and were scorched or baked by the heat, but not burned.

"A wooden hut, similar in construction to those at Aldershot, having been erected at Woolwich Marshes, for the purpose of testing the value of Phillips's Fire Annihilator, advantage was taken of the opportunity thus offered for trying to some extent, upon a larger scale, the merits of the silicate as a protective.

"Shortly before the experiment took place, an application was made to me by the officers of Royal Engineers, for the preparation, in some way, of a portion of the building with a protective agent.

"One part was painted, inside and out, with a mixture of lime and alum, which, however, was not found upon experiment to act as an efficient protective against fire.

"Another part of the hut was painted, inside and out three times, with a solution of silicate of soda.

"Unfortunately for the fairness of the experiment, the building was constructed with a double boarding, so that it was only possible to coat or impregnate the planks on one side. Nevertheless, the value of this agent was established beyond doubt.

"A large heap of shavings was lighted in the interior of the hut, against the coated portion of the wall. The flames played fiercely upon the latter for some minutes, but only succeeded in kindling one edge of a plank, and that portion did not blaze, but smouldered for a short time.

"By the heat of the fire the salt was drawn to the surface of the wood, and fused, forming a glazing upon it.

"Subsequently, when the whole building was destroyed by fire, after unsuccessful attempts to extinguish it by means of the 'Annihilators,' the fierceness of the flames was such that few materials could have withstood it; yet of the exterior coated portion of timber several planks remained.

"Upon examining these, the unprotected surfaces which had been directly exposed to the fire were found to be completely charred; but this charring had extended only to the point to which the silicate had penetrated from the other side of the plank.

"This experiment is considered to have proved that the silicate of soda is a very valuable protective agent, and that even when simply applied as a paint, it will serve to protect wood for a considerable time from fire, and to retard greatly the spreading of a conflagration."

Shortly after the experiments above described were made, the possibility suggested itself of rendering the coating of silicate less destructible by exposure to wet, of increasing its efficiency as a protective, and of rendering its application more economical by combining with its use that of ordinary lime wash.

Some pieces of plank were prepared in the following manner: a dilute solution of the silicate of soda was first applied with a brush; when this had thoroughly soaked into the wood and dried, a thick lime wash (made by slaking some lime, and reducing the hydrate to a smooth wash of the consistence of thick cream) was applied; and, lastly, after the planks

had been exposed to the air for two or three hours, they were painted with a second solution of silicate of soda, somewhat stronger than that first used.

The effects of the liquids thus applied, both upon the wood and on each other, will be more particularly pointed out in a report subjoined.

Several experiments, precisely similar to those described below, were made with the prepared planks, the results proving most satisfactorily that the protective coating resisted to a remarkable degree the action of heat, evinced no symptom of peeling off the highly heated surface of the wood, and protected the fibre to a great degree from the influence of flame playing upon its surface.

The durability of the coating was tested by exposing prepared surfaces of wood to a continuous stream of water and to heavy rains for a considerable period. It was found that the rain had no effect upon the coating: in the other more severe test the material was only to some extent removed, after a time, on that spot where the jet of water first impinged upon the wood.

A trial was made of the firmness of the coating, by applying heavy blows to the surface of the wood. The covering was only disturbed in one or two places, where the lime had been laid on rather too thickly.

Upon the results of these experiments being reported, an order was issued by Lord Panmure to have the proposed process for the protectection of wood from fire practically tested at some of the camps or stations.

It was ultimately arranged that a proper trial of the process should be instituted at Chatham, under the direction of Col. Sandham, R. E.

The nature of the experiments performed at Chatham, and the results obtained, are detailed in an official report, from which the following extracts are taken:

Extracts from a Report of Experiments at Chatham, from Col. Sandham, R. E., and F. A. Abel, Esq., to the Inspector-General of Fortifications.

Sir:—We have the honor to inform you that some experiments with silicate of soda applied in conjunction with lime wash, as a means of protecting wood from fire, and of retarding its combustibility, have been made at Chatham, on a sufficient scale to determine practically the value of this agent, if applied as a preservative to camp huts.

* * * *

We consider the experiments to have afforded conclusive proof, on a practical scale, of the considerable power possessed by silicate of soda, applied simply as a coating, in conjunction with lime, of retarding the inflammability of wood.

It is of course impossible, even by thorough impregnation of wood with various substances, to deprive it of the property of burning. The only results to be attained by the use of a protective material are—

1st. To shield the substance of the wood itself in a great degree from the effects of neighboring fire, or of the vapors which will issue from over-heated wood, and burn on its surface, and—

2d. To deprive the wood, to a considerable extent, of the power of carrying the fire along, thus rendering necessary the *continued application* of heat or fire from another source (such as an over-heated stove or unprotected portions of wood) in order to effect its thorough ignition.

An examination of the experiments shows that these results are obtained by the application of the silicate of soda to the wood.

This substance may be obtained in any quantity at a very reasonable rate, and the method of applying it is so simple, that the wood may be properly prepared with it by ordinary workmen.

It appears to us important that, if its application to new camp huts should be determined upon, the wood to be employed in their structure should be completely coated with the preparation before the erection of the buildings, in order to give the latter a fair chance of resisting the action of fire reaching the wood from any quarter.

But even in buildings already erected it is of importance that those portions which are in any way liable to possible exposure to heat or fire (that is, the portions in the vicinity of stoves), should receive the very considerable protection which would be afforded by the application of the silicate coating, any covering of paint or paper having first been removed.

We beg to give it as our opinion that the efficiency of the protective agent in question has been sufficiently tested to obviate the necessity of further trials upon a large scale; and submit, in conclusion, that, while the extensive employment of light wooden buildings for huts and temporary work-shops renders the application of some protective material to the *interior* of these, at any rate, a matter of great importance, it is of equal consequence that such an agent, if adopted for use in the service, should be easy of application and inexpensive, and that its employment should be as completely under the control of Government as that of any ordinary coating material.

H. Sandham.
F. A. Abel.

The above Report was accompanied by a communication relating to the cost of the application of the silicate coating, in which it was stated that, provided the silicate of soda employed has been prepared with especial reference to this application (that is, so as to be readily and completely mixable with water), one pound of the material is sufficient to prepare a surface of wood of ten square feet; while the wholesale price of the silicate, in the form of a syrup of a certain degree of concentration, is £20 per ton; so that the cost of the silicate required to prepare the wood is at the rate of about two pence for a surface of about ten square feet.

The following are the directions adopted for general guidance in preparing wood with the coating of silicate of soda and lime.

Directions for Covering Timber with a Protective Coating of Silicate of Soda and Lime.

Materials employed.—The silicate of soda must be in the form of a

thick syrup, of a known degree of concentration, as manufactured by Messrs. Simpson & Co., Kennington-road, London.

The lime wash should be made by slaking some good fat lime, rubbing it down with water until perfectly smooth, and then diluting it to the consistency of thick cream.

Treatment of the wood.—The protective coating is produced by painting the wood firstly with a dilute solution of silicate of soda; secondly, with the lime wash; and lastly, with a somewhat stronger solution of the silicate.

The surface of the wood should be moderately smooth; and any covering of paper, paint, or other material, should be first removed entirely, by planing or scraping.

A solution of the silicate, in the proportion of one part by measure of the syrup to three parts of water, is prepared in a tub, pail or earthen vessel, by simply stirring the measured proportion of the silicate with the water, until complete mixture is effected.

The wood is then washed over with this liquid, by means of an ordinary white-wash brush, the latter being passed two or three times over the surface, so that the wood may absorb as much of the solution as possible. When this first coating is nearly dry, the wood is painted with the lime wash in the usual manner.

A solution of the silicate, in the proportion of two parts by measure of the syrup to three parts of water, is then made; and a sufficient time having been allowed to elapse for the wood to become moderately dry, this liquid is applied upon the lime in the manner directed for the first coating. The preparation of the wood is then complete. If the lime coating has been applied rather too thickly, the surface of the wood may be found, when quite dry, after the third coating, to give off a little lime when rubbed with the hand. In that case it should be once more coated over with a solution of the silicate, of the strength prescribed for the second liquid.

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*Strength of Wire Ropes.**

A series of experiments have been made at Woolwich Dockyard, to test the comparative strength of the wire ropes manufactured by Messrs. Binks and Stephenson, of Millwall, under a new patent, and those made under their old one. The new ropes were made of the patent wire invented and manufactured by Messrs. Webster and Horsfall, which is unquestionably the most remarkable yet produced, the weight which a very small sized wire will bear being almost incredible. It is considered that it would be applicable to pit ropes generally, as it would save a great amount of engine power, and also for suspension bridges, &c. It was under consideration to employ it for the Atlantic cable, but the expense and the time which would then have been required to make the necessary quantity of wire deterred the directors of the company from adopting it. Messrs. Webster and Horsfall have, however, recently made such improvements in their manufacture as enable them

* From the London Mining Journal, No. 1184.

to sell the wire at a price which renders it as inexpensive to use as the ordinary rope wire. From the subjoined statement of the results obtained at the Dockyard, it will be seen that both the inventors of the wire and the manufacturers of the rope have good reason to be satisfied, as the weight borne previous to the ropes' breaking was really enormous:—

Breaking strain under old patent. Circum.	Tons.	Cwt.	*Breaking strain under new patent.* Circum.	Tons.	Cwt.
1½ inch rope,	2	5	1½ inch rope,	4	19
1¾ "	3	5	1¾ "	6	15
2 "	4	6	2 "	9	10
2¼ "	6	7	2¼ "	13	0
2½ "	7	8	2½ "	16	4
2¾ "	8	11	2¾ "	18	15
3 "	11	14	3 "	25	13
3¼ "	13	10	3¼ "	29	12
3½ "	15	6	3½ "	33	11
3¾ "	17	6	3¾ "	37	18
4 "	19	6	4 "	42	6
4¼ "	21	17	4¼ "	47	17
4½ "	24	8	4½ "	53	8
4¾ "	28	6	4¾ "	61	19
5 "	32	5	5 "	70	12

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*On two New Metals in the Swedish Magnetic Iron Ore.**

By Professor Ullgren.

I have recently received a magnetic iron ore from Westerby, near Askersund in Sweden, sent for analysis, with the statement that a small addition of this ore in the smelting of good ores, caused a high degree of deterioration of the iron obtained. In the analysis which I made of this ore, I believe I have discovered two metals, one of an electro-negative, the other of an electro-positive nature, and with properties which justify the assumption that they have not yet been made known.

The electro-negative metal has the following properties;—it is thrown down with a brown color by sulphureted hydrogen from an acid solution, and the precipitate is soluble with a brown color in ammonia and sulphuret of ammonium. Its solution in nitro-muriatic acid, when slowly evaporated, deposits a solid body of a brownish-yellow color. Before the blowpipe this gives colorless globules with salt of phosphorus, and furnishes no metal with soda upon charcoal.

The properties of the electro-positive metal are as follow:—From a solution of iron, mixed with a sufficient quantity of acetate of soda, it is thrown down by sulphureted hydrogen, together with iron and a small amount of zinc which is contained in the ore. After the precipitate has been partially dried upon the filter, iron and zinc may be removed by dilute muriatic acid, and afterwards nitric acid. The residue, calcined with access of air, and afterwards fused with carbonate of soda, yields a grayish-yellow substance, which, when calcined in hydrogen gas, furnishes a black powder, which burns in the air to a grayish-yellow body. The black powder obtained by reduction with hydrogen gas, is dissolved with extreme difficulty by nitric acid, but

* From the London Chemical Gazette, No. 373.

more readily by nitromuriatic acid; in this solution alkalies form a yellowish-brown, flocculent precipitate, ferrocyanide of potassium a blue or green one. Before the blowpipe it gives a colorless globule with salt of phosphorus; this becomes opalescent in the inner flame, and when a large quantity is present, gray. It is not in the least attracted by the magnet.—*Liebig's Annalen, December*, 1857, p. 336.

For the Journal of the Franklin Institute.

Particulars of the Steamer Ocean Queen.

Hull built by J. A. Westervelts, Sons. Machinery by Morgan Iron Works, New York. Intended service, New York to Southampton and Havre.

Hull.—		
Length on deck from fore part of stem to after part of stern post, above spar deck,		330 feet.
Breadth of beam at midship section,		42 "
Depth of hold,		22 "
" " to spar deck,		30 "
" keel,		1 " 6 inches.
Length of engine and boiler space,		141 " 9 "
Draft of water, at load line,		15 " 6 "
" " below pressure and revolutions,		13 "
Area of immersed section at this draft,	536 sq. ft.	
Tonnage, custom-house,	2830.	
Contents of bunkers in tons of coal,	800.	
Masts and rig—brig.		
Engine.—Vertical Beam.		
Diameter of cylinder,		90 inches.
Length of stroke,		12 feet.
Maximum pressure of steam in pounds,	20.	
Cut-off—variable.		
Maximum revolutions per minute,	15.	
Boilers.—Three—Return flued.		
Length of boilers,		36 feet.
Breadth "	at furnaces, 14 feet, at shell,	11 " 6 inches.
Height " exclusive of steam chimney,		11 " 3 "
Number of furnaces,	3 in each.	
Breadth "		4 " 3 "
Length of grate bars,		7 " 6 "
Number of flues,	16.	
Internal diameter of flues,	10 of 18 ins., 6 of 14 ins.	
Length of flues,	lower, 23 feet—return,	30 " 2 "
Heating surface (fire and flues),	7155 sq. ft.	
Diameter of smoke pipes,	1 of 85 ins., 1 of 77 ins.	
Height " "		32 "
Description of coal,	Anthracite or Bituminous.	
Combustion—natural draft.		
Paddle Wheels.—		
Diameter,		38 feet.
Length of blades,		10 " 6 inches.
Depth "		2 "
Number "	32.	

Remarks.—Floor timbers at throats—*molded*, 17 ins., *sided*, 10 ins. Distance of frames apart *at centres*, 30 in. Frames strapped with diagonal and double laid iron straps, $4\frac{1}{2}$ by $\frac{7}{8}$-inches. Has four water-tight bulkheads.

C. H. H.

*Note upon the Electric Light, and its Actual Cost, compared with the Cost of Gas, Oil, or Candle Light.** By M. Edmond Becquerel.

(Extracted from *Les Nouvelles Annales de la Construction.*)

The regulators of the electric light already known, act in a manner so satisfactory, that their application is possible in cases in which the source of electricity offers the necessary conditions of constancy and economy: it is only necessary to improve the mode of preparing the charcoal points required to complete the circle, for the want of purity and homogeneity of those conductors is the principal cause of the intermittences which may be observed in this source of light.†

The most important point to be settled, in the inquiry into the cost of the electric light, is the expense of the piles which produce the electricity, by estimating the consumption of the zinc, of the sulphuric, and of the nitric acid, necessary to create in a voltaic circle a given quantity of light during several hours. The results obtained show that the luminous intensity of the circle, measured by means of the protometer, diminished very rapidly during the course of the experiments, whilst the intensity of the electric current had only varied in a slight degree. But this effect may be easily explained if we consider that the luminous intensity must be a function of the quantity of heat given off, which varies as the square of the quantity of electricity traversing the circuit in a given time: the decrease of light was, indeed, more rapid than this law would indicate.

If the intensity of the voltaic light do not vary in proportion to the consumption of the matters which produce the electricity of the voltaic pile, it becomes almost impossible to ascertain the law according to which the expense necessary for the production of a light of a given intensity varies, as in the case of the light obtained from certain other combustible matters. But it is possible, as we will hereafter show, to indicate the limits within which this expense is comprised, when Bunsen plates, of ordinary dimensions, are used, in which the diaphragm, or porous cylindrical vase, is about 8 inches high, from $2\frac{3}{8}$ to 6 inches diameter, and whose number is comprised between 40 and 80. With a pile of 60 elements, which had worked for three hours, the quantity of zinc consumed per hour was, at the commencement, 2·39463 lbs. avoirdupois, and the total expense of the products consumed was 2 f. 85 ctms.; the quantity of light produced being equal to 506 candles. After three hours, the consumption of zinc was only 1·82133 lbs., the cost was 2 f. 15 ctms., and the quantity of light equal to 195 candles. On the average, then, per hour, the zinc consumed was 2·10798 lbs., the expense 2 f. 50 ctms., the quantity of light equal to 350 candles. The expense in zinc was calculated according to the intensity of the current, measured by a compass of sines introduced in the circuit, and consid-

* From the Journal of Gas Lighting, &c., No. 128.

† The invention lately patented by Mr. Way, for substituting a capillary stream of mercury for the charcoal points formerly used, entirely obviates the objection to the use of the electric light on the score of its irregularity; but at the same time, it appears to us that it must increase the cost. It is essential, however, to observe, that M. Becquerel, as will be seen by the sequel of this article, assumes that no use can be made of the spent liquors of the batteries, whilst the Electric Light and Color Company are understood to obtain from them some products of considerable value in the Arts.—Editor J. G. L.

ered with reference to the action which would be produced in a voltaometre of the sulphate of copper by an electric current of the same intensity; the expense in sulphuric and nitric acid was calculated by equivalents.

Now the expense of the plates is greater than would be indicated by the theory of electro-chemical decompositions in definite proportions; for if the zinc which had served for a previous experiment might serve for a new one, the nitric acid, whose areometric degree had fallen from 36° to 25°, would not produce upon the plates a sufficiently energetic action to obtain the luminous arc in good conditions. Moreover, it is necessary to take into account the loss of mercury: the consumption of the zinc, a little beyond that indicated by theory; and, in addition, the price of the charcoal points through which the circuit is completed. &c., &c.

For these reasons we think that, under the conditions of the experiments recorded above, and with a resistance to the external conductibility equal to that of the pile, it may be admitted, without exaggeration, that each couple costs 5 centimes per hour, or ½d. English money nearly.

If we compare the cost prices of the different sources of light, equivalent to 350 candles, the mean intensity derived from the above experiments, we find the following numbers:—

Coal gas,* at 3s. 4d. per 1000 cubic feet, nearly . .	0s.	8½d.
" 6s. 8d. " " . .	1	5
Oil (rape-seed), at 8½d. per lb., avoirdupois, . .	2	5
Tallow, at 2s. 1d. per lb., ...	5	0
(No doubt there is a misprint here in the original: the price of tallow would not, in all probability, exceed 8½d. per lb.)		
Stearine candles, at nearly 1s. 3½d. per lb., . . .	10	6
Wax candles, at 2s. 1d. per lb., . . .	13	0
Electric light, ...	2	4

It thence appears that for the same quantity of light, and taking only into account the cost price of the matters consumed, *without reference to the labor*, the electric light, in the conditions we have studied, would be four times dearer than gas light at the price charged to the town of Paris; its price would be the same as for oil lighting, and the quarter of that of an illumination by wax candles: but, if the labor necessary to superintend the machinery, to prepare and to renew the plates, &c., were added, the price ought at least to be doubled. These results might vary if batteries with an increased number of plates were used, and the expense would be diminished by using a greater number of voltaic elements; but as the number of plates is ordinarily limited to 60 or 80, the preceding conclusions may be applied to the experiments hitherto made upon the electric light.

In these experimental researches, we have been led to a rather curious result: the resistance to the conductibility of the voltaic arc was measured; that is to say, by assimilating the incandescent materials

* The numbers relating to gas lighting are, as is well known, very variable; they depend on the size of the burner, its form, the manner in which the combustion takes place, and, lastly, upon the composition of the gas itself. The above number is a mean ascertained by experiments made with coal gas in the conditions, and with the form of burners which served for the observations.—*Note by* M. Becquerel.

which compose it, and which transmit the electricity to a metallic conductor, we found that the resistance was equal to a number varying from 0·50 to 0·67 of the resistance to the conductibility of the pile; and that it was necessary to remain within these limits, in order to keep the voltaic circle in favorable conditions. Now, it is known that the maximum calorific and magnetic effects of a battery are obtained when the resistance to the conductibility is equal to that of the couples: it thence would appear that, by practical experiments, we have been able to hit upon the conditions which theory indicates as giving the most energetic action a battery is able to produce.

It is interesting to compare the numbers above indicated with those which would be obtained if we estimated the motive force it would be necessary to apply to an electro-magnetic engine able to maintain a voltaic circle equal to that of the above experiments. If we compare these experiments with those obtained last year by the use of the machine in operation at the *Conservatoire Impérial des Arts et Métiers*, it will be found that it would be necessary to apply a force equal to $2\frac{1}{4}$ or nearly $2\frac{1}{2}$ horses power to this machine, in order to produce an electric current able to maintain, constantly, a luminous arc equal to 350 candles in its effect. This estimation is only applicable to the limits of the intensity of the current within which we have operated. From this it appears that the electricity so obtained would be the least costly source of that agent; in this case, it is only a question of the production of the electric light, for, so far as the other applications of electricity are concerned, the production of electricity by this means would not be effected under the same economical conditions.

We have thus explained how the cost price of the electric light may be ascertained; but it is necessary to say under what circumstances it may be applied. It must be evident from the conditions themselves of the voltaic current, that they do not allow of the lights being divided, as in the case of public lighting; far from this being the case, the electric light is concentrated; and the difficulties which are encountered when it is desired to obtain two or more arcs with the same current and the same circuit are such that we are forced to renounce the effort. Indeed, the sum of the resistance to the conductibility of the separate arcs must be equal to that of the single arc; and when we think of the conditions required to regulate the fixity of a single arc, we may easily conceive that it becomes more difficult, even if not entirely impossible, to regulate in the same circuit two or more separate arcs, which would then be much shorter.

But if, under existing circumstances, we cannot think of applying electricity to public lighting, it may be advantageously applied to special works, as, indeed, it has already been so applied. It may be sufficient to mention night works, works executed under water, public lectures, &c.; it is even probable that it might be advantageously used in lighting the galleries of mines, for signals on board ships, for light-houses, and in a number of circumstances in which it may be necessary to produce during a given time, of a longer or shorter duration, a light of an extremely great intensity,

*Protective Matting for Horticultural and Agricultural Produce.**

Dr. Guyot, of Paris, the proprietor of extensive vineyards, in Sillery, Champagne, has introduced in France, and is now introducing in England, a simple but improved description of straw matting for the protection of horticultural and agricultural produce, together with a loom or apparatus for manufacturing the same. On a careful examination of the merits of Dr. Guyot's invention, we have found it to be a very valuable one, and most heartily recommend its adoption.

The fabric is composed of a weft of straw, cane, bass, rush, reed, or other similar material, woven into or combined with a warp consisting of two sets of warp threads, each set composed of two wires or stout cords twisted together; and it is manufactured as follows:—The straw, bass, or other material, is cut into even lengths, and spread on a table with a central slot or channel from end to end, where, by means of a comb or reed with conical teeth, the mass is divided into clusters (the thickness of each cluster being according to the space between every two adjoining teeth). The comb is driven into the straw just over the channel. The table is then brought to the weaver, who takes a cluster at a time, and feeds it in a loom or frame, in which the warp, cords, or wires are delivered off in two's from four reels set in the same spindle mounted in the standards of the frame, and are passed through eyes and grooves in plates which act as heddles, being connected by a double escapement or otherwise to treadles, by which they are depressed and brought up again by springs at top, whereby the warp threads are crossed, two by two, alternately, each set being opened to form a shed, through which the weft is introduced. The fabric, as it is woven, is wound off on a beam made to revolve by a weighted lever; the weight also effects the draft and tension of the warp threads, being brought back from the end of its stroke by hand or otherwise; or the beam may be turned, and the warp threads delivered off and opened to form the shed by steam or other power which may be employed to work the frame. Pins may be let in the fabric to fix it in place, or it may be mounted on stakes with cross-pieces, or on swivelled rods, or on adjustable frames, so that the position of the matting may be varied when used for sheltering a plant; or it may be mounted in rollers like a blind to cover conservatories, &c.

The breadth of the fabric varies from about 1 foot 3 inches to 2 feet. The lesser breadth is the better for protecting plants placed in rows or beds, or in hot-houses and other like places, and the greater breadth for protecting wall fruits, such as peaches, apricots, &c. The matting is made of any desired length, being rolled up into rolls, like carpeting, as it leaves the loom or apparatus in which it is woven, and which has been designed especially for its manufacture. It weighs but little, and may consequently be transported with ease, and at a small expense. It may be handled roughly without risk of injury, arranged in any desired form or manner, cut into any required lengths, and, if desired, be re-united again without difficulty. It is so easily applied in the garden or orchard

* From the Lond. Mech. Mag., Nov., 1857.

that ten men will, in a single day, fix it over thirty thousand feet of plants, and that so firmly and surely that it will resist the most violent storms to which it may be exposed.

During the last two years, 1856-7, Dr. Guyot applied this matting to the protection of 180,000 feet of vines on his estate at Sillery, and has thus obtained fruit three times more abundant, and much finer than that of the neighboring vineyards. He has obtained similar success in the cultivation of garden plants and wall fruits on a very large scale. These results have been investigated by scientific and agricultural commissions, and their reports have obtained for him the medals before mentioned, and other rewards in testimony of the value of his invention.

The new fabric, being once introduced into the market, will be used not only for the protection of horticultural and agricultural produce, in corn fields, hay fields, market gardens, kitchen gardens, and orchards, but also for forming light sheds and other inclosures for preserving implements, fowls, swine, &c., for wrapping various materials in, for covering floors in country houses, &c., &c. The modes of applying the fabric to these various purposes, of course, vary, but are in all cases simple and inexpensive.

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*Cards for Jacquard Mechanism.** WILLIAM WHITEHEAD, Huddersfield.—Patent dated May 19, 1857.

According to one modification of this invention, the cards to be used in Jacquard machines may be composed of wood, metal, or other strong and durable material, these cards perforated throughout to correspond to the whole of the needles in the Jacquard, and when required for any particular pattern, the holes are plugged up by small pegs inserted therein in any required order and number to suit the particular design to be produced. When a change of design is required, the pegs are withdrawn, and are again inserted in a different order—one set of cards being thus made to serve any number of designs.

These cards may be laced or tied together in any convenient and durable manner. The plan at present adopted is to connect each card with its neighbors by means of small wire links at each end of the card.

Electro-Telegraphic Progress.†

It has been estimated that there are already 78,350 miles of telegraphs constructed and in progress of construction:—In Europe, 37,900 miles; United States, 33,000; India, 5000; South America, 1500; and submarine—Europe and America, 900. It is probable that in less than six months all these lines will be in full operation. The completion of the Atlantic telegraph will increase the aggregate mileage stated above by 1700 miles.

* From the Lond. Practical Mech. Jour., March, 1858.
† From the Lond. Civ. Eng. and Arch. Journ., Jan., 1858.

*On some Physical Properties of Ice.** By Prof. Tyndall.

The author prefaced his observations with some remarks on force in the abstract, referring in particular to the force by which crystalline architecture is accomplished. Some phenomena of crystallization were shown by means of the photo-electric microscope. The manner in which the molecular aggregation was affected when a beam of radiant heat was sent into the interior of a mass of ice, was examined. The track of such a beam presented a beautiful appearance—flattened spheroids were observed, which at certain incidences of the light shone with more than metallic brilliancy, and around each a liquid flower, consisting invariably of six petals, was formed. The spot at the centre of each flower was proved to be a vacuum, and the formation of the flowers in a piece of ice through which a beam of electric light was transmitted was rendered visible to the audience. The air and water cavities, which, in the case of glacier ice, have caused so much discussion, were next examined. It was proved that the water was due to the melting of the ice round the air cavities. The hypothesis propounded by M. Agassiz and the Messrs. Schlagintweit to account for this water, and which has hitherto been universally accepted, is, that the ice permits the radiant heat to pass, the heat warms the air, and it in its turn melts the ice. It was proved by the speaker that this view is wholly untenable. One of its consequences would be that a bubble of air would be capable of absorbing in a few minutes a quantity of heat which would raise its temperature upwards of 400,000 degrees, or more than 160 times that of fused cast iron. The melting of the ice was shown to be a simple consequence of the dynamical theory of heat: molecular motion is transmitted through the solid ice, without prejudice to its solidity, and detaches the particles at the surface of the internal cavity, as the last of a series of elastic balls is detached by force which has traversed a row of them without producing visible separation. The passage of snow into glacier ice was next considered. It was referred to the enormous pressure of the moist *neve* upon its own mass. That moisture was necessary, was shown by moulding ice at 32 deg. into cups; while, when it was rendered perfectly dry by immersion in a bath of solid carbonic acid and ether, the ice on being crushed became a powder as white as snow. Crushed glass or quartz could not have been whiter or more opaque.

Hodges' Patent Triangular Scales and Gauges.†

Mr. R. E. Hodges, of Southampton-row, Russell-square, the ingenious inventor of the india rubber accumulator springs, and other useful contrivances, has introduced a new description of scales and gauges, which are attracting notice at the Society of Arts' Exhibition of Inventions. The accompanying engravings illustrate the nature of these instruments. Fig. 1 is a strip of wood, ivory, or metal, supposed to be 10 inches long and 1 inch wide, with a diagonal cut severing it in two. Each inch is divided into 10, and the whole into 100 parts (divisions of

* From the Lond. Practical Mech. Jour., March, 1858. † From the Lond. Mech. Mag., May, 1858.

50 to the inch, or 500 on the whole length, could be read off easily by the naked eye). It is evident that each move of the 10th of an inch of the one triangle upon the other, whether backwards or forwards, must decrease or increase the width of the scale the 100th part of an inch, and also that the scales will be parallel in those parts which over-

Fig. 1.

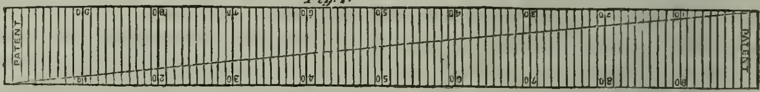


Fig. 2.

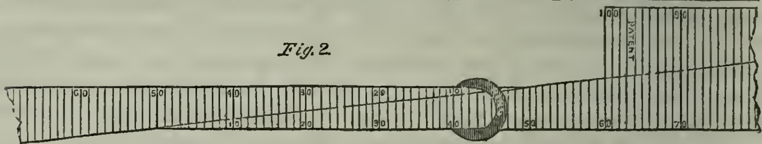


Fig. 3.

lap each other. Parallel lines may be drawn with this scale at equal distances, or at any desired distance from each other: and mechanical and other drawings (not curved) may be measured, the respective distances of their parts noted; and then reproduced on an increased or diminished scale.

Scales of this description will enable a carpenter or other handicraftsman to set out tenons, as with them he can at one operation, that is to say, without shifting the scales, draw two parallel lines at any desired distance apart, and the width of the scale may be increased by using in conjunction with it any common rule or strip of known width.

Fig. 2. The triangles are here slided down until the width of the scale is narrowed to 50 hundredths or half an inch, and the manner of gauging a ring of that internal diameter is shown. It will be seen, also, that by reversing the position of the apices the width of the scale is increased.

Fig. 3. Two simple sections are sufficient to gauge the mouth of a tube; but when it is desired to gauge a tube (as, for example, a gun barrel) from one end to the other, then two sections may be employed, both capable of entering the tube, and to these sections may be attached rods, which may be graduated so as to show the distance of the sections from the mouth of the tube, when each gauging is obtained. In order to facilitate the readings of the gaugings, there are two sections attached to the upper ends of the rods, similar in all respects to the sections within the tubes, and as the rods are of equal lengths, the sections will always occupy corresponding positions, and the reading of the upper one will be the same as the reading of the lower.

Fig. 4. In order to keep the sections in their proper relative positions, they may be grooved to fit one another, as in fig. 4.

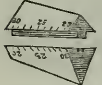
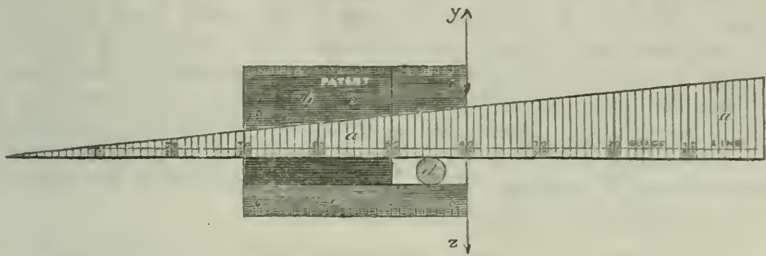


Fig. 4.

Fig. 5, shows the "gauge plate," made of steel or other metal, or of wood, for gauging needles, wire, screws, sheet metal, turners' work, &c. The diameter, or the thickness, is read off at the arrow, where the opening is supposed to be one inch wide. It reads "60" hundredths, as the space

occupied by the scale, which being subtracted from 100, leaves 40 hundredths of space occupied by the iron rod, *d*. But for greater simplicity

Fig. 5.



there is a guage line giving "40" at once as the real diameter sought. These gauge plates may be made of sizes to suit the requirements of different trades. The external form of the gauge plate makes it useful for the purposes of a common square.

Section through y z, fig. 5.

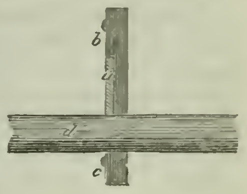
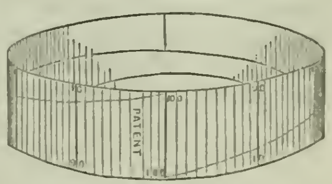


Fig. 6. A pair of triangles, graduated either externally or internally, are set in a cylindrical form. The upper triangle may be divided into two parts, one part only being used at one time.

"The acknowledged 'confusion of gauges,' and the difficulty of taking minute and accurate measurement, called," says the patentee, "for a simple and inexpensive instrument to supply the want. The principle of these scales and gauges will be found correct. The parts or pieces by which the measure is taken are not easily injured or worn by common or even hard usage. The working is more easy in practice than in theory. Decimal figures may occupy one side of the scale, the old division of the inch (as used on the English foot rule) the other; and in France the centimetres will compare with the '*pouces et lines.*' Thus mechanics of ordinary intelligence will soon understand, and no doubt prefer the decimal."

Fig. 6.



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*Hydrostatic Screw Propeller.**

The Southampton correspondent of the *Star*, daily paper, in describing a successful trial of the hydrostatic screw propeller, or steamer driven without a shaft, which is now exciting public interest, says,—"All that would be required for the largest ship afloat [by the adoption of this invention] would be one horizontal steam cylinder, placed close to the bottom of the vessel, connected to one pump, also laid on the bottom of the vessel, close to the kelson, working fore and aft the

* From the London Builder, No. 760.

ship without shaft or crank; and by forcing water through the hollow screw propeller, producing a powerful rotary motion, where only it is required, namely, in the screw; which can by this invention be driven continuously five hundred or more revolutions per minute, and as the whole is immersed in a constant stream of cold water, there is no possible chance of heated bearings. The water surrounding it on all sides becomes a constant lubricator. The power of manœuvring the propeller from the deck, no matter at what rate the vessel may be sailing, is another peculiarity. The invention would also prevent the possibility of a ship being destroyed by fire, and would act as powerful bilge-pumps in case of leakage. The inventor and patentee is Mr. Samuel Stevens, builder and contractor, of this town.

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*Purification of Gas.**

Alex. Ross, James Vallentine, A. Murray, and Alex. Don, Fettercairn, Kincardineshire, have invented a new process for purifying coal gas, by the use of all kinds of pine-tree and hard wood, either in a state of saw-dust or in a chopped and bruised condition, in lieu of the ingredients hitherto employed for purifying coal gas; the same ordinary purifying apparatus, without alteration, serving for the purpose of purifying gas according to this invention, thus:—The gas coming into contact with the saw-dust, or wood in any other state, chemical action ensues, and effects the purification of the gas, and the purifying matter (wood) is converted into a suitable manure or fertilizing agent; or, if not used for that purpose, it may be employed with advantage in the retorts, in lieu of coal, in the ordinary process of manufacturing coal gas, when it will be found to yield a considerable quantity of an excellent gas, and the residuum in the retorts will be pure charcoal.

Aluminum.†

This new metal is still making hopeful progress. The *Mining Journal* states that Mr. F. Wm. Gerhard, of Trafalgar-square, has patented a simple and economic process for obtaining the metal, whereby it is produced at a considerably less expense than by the means heretofore practised. In this process hydrogen gas combines in an oven with the fluoride of aluminum, and forms hydro-fluoric acid, which acid is taken up by iron, and is thereby converted into fluoride of iron, whilst the resulting aluminum thus obtained remains in the metallic state in the bottom of trays containing the fluoride.

English Coal and Human Power.‡

Prof. Rogers estimates that nearly one-sixth of the total annual produce of our coal mines is used for the production of mechanical

* From the London Builder, No. 758. † Ibid. ‡ From the London Mining Journal, No. 1173.

power alone, from which a power equal to that of 66,000,000 able-bodied men is obtained. Each acre of a seam yielding 3 feet of pure fuel is equal to about 5000 tons, and possesses a reserve of mechanical strength equal to the labor of 1600 men during their whole life; and each square mile of the same bed contains 8,000,000 tons of fuel, which is equal to 1,000,000 men laboring through 20 years of their ripe strength. Upon the same calculation, the total annual coal production of the United Kingdom (65,000,000 tons) is equal to the strength of 400,000,000 strong men, or more than double the number of adult males now upon the globe.

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*Basic Nitrate of Bismuth as a re-agent for Grape-Sugar.**
By Professor Böttger.

In testing urine for example, for sugar, if 1 volume of urine be boiled with an equal volume of a solution of one part of crystallized carbonate of soda in 3 parts of water, and a very small quantity of basic nitrate of bismuth be added to it, the latter becomes gray by reduction, if grape-sugar be present. Cane-sugar does not possess this property, and none of the other bodies occurring in the urine blacken the bismuth salt.—*Journ. für Prakt. Chemie*, lxxi. p. 431.

* From the London Chemical Gazette, No. 362.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, August 19, 1858.

John C. Cresson, President, in the chair.

John Agnew, Vice-President.
John F. Frazer, Treasurer. } Present.

William Harris, Recording Secretary, pro tem.

The minutes of the last meeting were read and approved.

A Letter was read from Lieut. Col. James D. Graham, United States Topographical Engineer, Chicago, Illinois.

Donations to the Library were received from the Royal Geographical Society and the Statistical Society, London; the Maryland Institute, Baltimore, Maryland; the Young Men's Institute, New Haven, Connecticut; the Association of the Franklin Medal Scholars, Boston, Massachusetts; the Mercantile Library Association, City of N. York; the Trustees of the Farmers' High School, Carlisle, Pennsylvania.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement of the receipts and payments for the month of July.

The Board of Managers and Standing Committees reported their minutes.

On motion, the Committee on Exhibitions was instructed to take the necessary steps to hold an Exhibition of American Manufactures, next Fall, agreeably to their recommendation this evening.

Candidates for membership in the Institute (5) were proposed, and the candidates (4) proposed at the last meeting were duly elected.

The Board of Managers reported that at their meeting held 17th instant, they elected Mr. James Dougherty and George Whitney, members of the Board to fill the vacancies occasioned by the death of Mr. Abraham Miller, and the resignation of Mr. Charles Magarge.

They also elected L. A. Hugeut-Latour, Esq., of Montreal, Canada, a corresponding member of the Institute.

Mr. Howson exhibited (from the model room) two full-sized pieces of 60 lbs. rails, connected by Ellwood Morris's "*railroad splice*," for which a patent was obtained July 27th, 1858.

The peculiarity of the "*Morris splice*," consists in obtaining adequate strength for the *fish pieces*, (when used with the low American rail,) by turning them under the bottoms of the rails, while at the same time bolting them as usual *sidewise* through the necks of the rails, with *four* bolts to each joint.

This splice may be used either in *one* or *two* pieces, the latter being usually preferred, and on a length of two feet weighing 36 lbs. gives a strength which effectually splices the joints of rails, and at a cost not exceeding *two dollars each.*

This splice has been well spoken of in the English Railway Journals, and appears to promise excellent results in practice.

H. D. King, Agent, exhibited specimens of improved manufacture of bright steel and iron, by Jones & Louth, of the American Iron Works, in Pittsburgh, designed to be used as piston rods, shafting, and all kinds of steel or iron requiring a bright smooth surface. The improvement consists in removing the scale from the surface by a chemical process, and then producing a smooth surface by rolling; finishing it sufficiently smooth and straight for all practical purposes, (adding both density and stiffness,) doing away with the usual process of turning, for which (the inventor, Mr. Louth,) a patent is pending in the United States, and has already been issued in England.

Mr. John H. Cooper exhibited his improved regulator for controlling the pressure of gas at the burners.

This instrument consists essentially of a small conical valve capable of opening and closing the aperture, which admits the gas from the metre to the pipe supplying the burners, and an inverted cup or gasometer having a cylindrical rim dipping in mercury.

This cup is guided in its vertical movements by an arm hinged loosely to the casing, which contains all the parts, and to the cup, by which arrangement the latter is wholly unencumbered by friction.

The cup is loaded with weights to a certain permanent pressure, which experiment determines to be the most economical and advantageous for consumption of gas, and when so adjusted the instrument requires no further attention from the consumer.

Extreme sensitiveness is secured in this instrument by hinging and supporting the working parts on fine axes wholly removed from the corrosive action of the gas; for this reason, the tendency to become inactive, is rendered almost impossible.

When the street pressure of gas is low, owing to a deficiency in the mains, this instrument offers no obstruction to the free flow of gas, and when the pressure again increases it comes into action, checking any increased flow of gas to the burners beyond that required for economic consumption.

COMMITTEE ON SCIENCE AND THE ARTS.

Report on J. L. Gatchell's Lightning Rod and Points.

The Committee on Science and the Arts constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination, "an Improved Copper-Braid Lightning Rod and Points," invented by Mr. J. L. Gatchell, of Elkton, Maryland,

Report:—That the rod now submitted, appears to be in most respects, similar to that reported on favorably by this Committee, June 8th, 1854. (See *Journal Frank. Inst.*, 3d Series, vol. xxviii, (July, 1854,) page 68.)

The variations consist, first, in the substitution of a rope of twisted copper wire (containing 18 strands of wire about $\frac{1}{16}$th inch in diameter,) by which are gained greater conducting power, freedom from breaks, or joints in the conductor, and a flexibility which allows it to be adapted to any irregularities of form over which it may be carried. The proprietor also suggests the absence of iron-stain by which the stones or paint of the building are so frequently disfigured, but this will only be measurably an improvement, as, unless the copper be kept carefully painted, it will also stain the building, though in a less degree.

The second modification is the substitution of a copper for a platina point, and the increasing the angle of the point, so as to approach that recommended by the Committee of the French Academy of Sciences, and published in the *Journal of the Franklin Institute*, 3d Series, vol. xxxiii, (April, 1857,) page 269. The advantages here gained are greater conducting power by the substitution of copper for platina, and secondly, a counteraction of the liability to fusion by rendering the point much less acute. The preservation from oxidation is entrusted as in Mr. G's. former rod to a zinc ball attached below the point.

The Committee believe that the modifications made by Mr. Gatchell in the construction of his rod, are such as to increase its efficacy, and if he is right in supposing that they will not materially increase its expense, they undoubtedly constitute a valuable improvement.

The Committee therefore renew their recommendation of Mr. Gatchell's lightning rod, as being cheap, durable, and efficient.

By order of the Committee,

Philadelphia, August 12th, 1858. Wm. Hamilton, *Actuary.*

ERRATA.

Vol. xxxv—page 415, line 32—for "*hour*" read "*second.*" Line 34—for "*undeterminate*" read "*indeterminate.*"

Abstract of Meteorological Observations for June, 1858; *made in Philadelphia, Somerset, Bedford, and Huntingdon Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.*

June, 1858.	PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.									SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2105 feet. GEO. MOWRY, Observer.						BEDFORD, Bedford Co. SAMUEL BROWN, Observer.			HUNTINGDON, Huntingdon County. JACOB MILLER, Obsr.			
	Barometer.		Thermometer.			Relative humidity.	Force of vapor.	Rain.	Prevail'g winds.	Bar.	Ther.	Relative humidity.	Force of vapor.	Rain.	Prevail'g winds	Bar.	Ther.	Prevail'g winds.	Bar.	Ther.	Rain.	Prevail'g winds.
	Mean.	Mean daily range.	Mean.	Daily oscillation.	Mean daily range.	2 P. M.	2 P.M.			Mean.	Mean.	2 P. M.	2 P.M.			Mean.	Mean.		Mean.	Mean.		
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.		Inch.	°	Per ct.	Inch.	Inch.		Inch.	°		Inch.	°	Inch.	
1	29·840	·096	64·7	15	4·2	75	·520		S S W.	27·691	61·0	56	·397		(var.)	29·112	65·0	N W.	29·315	68·0		(var.)
2	29·932	·091	73·7	25	9·0	35	·367		N W.	27·796	62 3	44	·381		E.	29·275	64.0	N W.	29·485	65 0	0·059	E.
3	29·929	018	75·3	23	1·7	31	·361		N W.	27·732	59·0	80	·436	0·009	S.	29·192	65·7	S E.	29·380	67·0	0·736	E.
☽ 4	29·791	·138	71·3	13	4·0	57	·549	0·010	(var.)	27·560	72·3	63	·689	0·230	(var.)	28·977	74·0	S W.	29·161	74·0	0·230	S.
5	29·758	·092	78·8	18	7·8	59	·683		S W.	27·608	67·0	76	·617	0·411	W.	29·044	76·3	S W.	29·239	73·3	0·070	W.
6	29·783	·027	81·2	18	3·0	49	·640	0·005	S W.	27·600	65·0	84	·556	0·017	WSW.				29·232	70·0	0·038	S.
7	29·936	·153	80·7	20	0·8	42	·542		S W.	27·769	68·3	63	·662		WSW.	29·208	75·3	S W.	29·396	73·7		S.
8	29·919	·017	80·0	19	1·3	54	·648		(var.)	27·754	71·3	62	·636		W.	29·180	73·3	N W.	29 383	77·3		E.
9	29·875	·046	82·2	21	3·2	50	·706		(var.)	27·661	75·3	50	·656		(var.)	29·087	75·7	S W.	29·278	73·3	0·228	(var.)
10	29·688	·187	83·7	17	2·2	53	·720		S S W.	27·551	76·0	60	·703		S W.	28·931	79·3	S W.	29·100	78·3		(var.)
● 11	29 654	·079	82·0	20	4·3	48	·723	0·218	S W.	27·510	67·7	87	·651		WSW.	28·919	73·3	S W.	29·128	70·7	1·342	N.
12	29·697	·048	61·3	18	20 7	91	·471	3·946	N E.	27·477	66·3	81	·654	0·468	S E	28·918	61·3	N W.	29·133	63·0	0·298	N.
13	29·709	·041	63·2	13	6·5	78	·464		N E.	27·508	57·7	79	·419	0·551	W.				29·148	63 3	0·018	W.
14	29·743	·034	61·7	8	1·5	73	·451	0·023	N E.	27·585	53·7	66	·353	0·081	(var.)	29·034	59·3	N W.	29·230	60·0		N.
15	29·768	·028	62 8	11	1·2	73	·470		N E.	27·592	59·0	62	·488		N.	29·039	61·3	N W.	29·236	62·3		(var.)
16	29·909	·141	65·3	14	2 5	62	·488		(var.)	27·686	64·0	57	526		S W.	29·119	68·7	N W.	29·328	66·0		S.
17	29·957	·048	68·3	21	3·7	61	·563		E.	27·753	69·7	59	·649		S E.	29·207	67·3	S E.	29·398	69·0		S.
☾ 18	29·761	·163	77 0	24	8 7	57	·689		S W.	27·714	70·0	56	·609		WNW	29·111	74·3	S W.	29·300	73·7		(var.)
19	29·779	·060	84·7	21	7 7	48	·692		WNW	27·715	70·7	63	·602		W.	29·083	77·3	S W.	29·279	76·3		W.
20	29·761	·018	83·0	19	1·7	55	·772		(var.)	27·699	73 0	51	·635		W.				29·263	77·7		W.
21	29·754	·006	85·7	23	3·3	43	·665		(var.)	27·685	72·7	54	·648		W.	29·060	77·7	N W.	29·246	78·7		W.
22	29·887	·131	78·7	12	7 0	60	·676		E.	27·707	73·7	51	·635		(var.)	29·143	80 0	N W.	29·309	80·0		(var.)
23	30 006	·123	75 3	20	4·0	60	·676		(var.)	27·786	74·3	64	·774		S E.	29·227	74·3	S E.	29·440	76 3		S.
24	29 927	·076	81·0	19	5·7	53	·747		S W.	27·748	72·0	68	·788	2·155	(var.)	29·162	72 3	S W.	29·353	76·0	0·110	N E.
25	29·796	·131	86 7	18	5·7	57	·859		S W.	27 702	73·7	68	·849		(var.)	29·086	77·3	S W.	29 274	77·0	0·145	(var.)
○ 26	29·751	·056	88·7	19	2·0	49	·785		WNW	27·693	74·7	68	·818		W.	29·059	78·7	N W.	29·257	82·7		(var,)
27	29·787	·036	88·8	19	0·8	48	·778		N W.	27·698	77·0	53	·750		W.				29·279	81·7		N.
28	29·742	·045	89 2	19	2·3	50	·835	0·003	N W.	27·684	74·7	64	·745	0·108	N W.	29·051	83·0	N W.	29·239	82 3		N.
29	29·775	·033	86·8	22	4·3	38	·609		(var.)	27·682	77·0	55	·733		N W.	29 047	82·7	N W.	29·239	81·3		N.
30	29·767	·008	87·7	19	0·8	41	·652		N W.	27·661	77·3	51	·714		N W.	29·021	83·3	N W.	29 202	82·7	0·280	N.
Means	29·813	·072	77·5	18	4·4	55	·627	4·205	N72°W.	27·667	69·0	63	·628	4·030		·			29·275	73·3	3·554	

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

OCTOBER, 1858.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

On the necessity of further Experiments on Friction, especially upon Railroad Frictions, or the Friction of Metals in motion, under heavy insistent weights and small surfaces of pressure. By ELLWOOD MORRIS, Civil Eng.

The importance of a correct knowledge of the laws of friction can hardly be exaggerated, as without this knowledge, the finest conceptions of the mechanic and engineer would fail to realize their appropriate results. In modern times these laws have received great attention, and yet in some of the most important frictions of the day, the experiments which guide us are both *inadequate and anomalous.*

A long roll of the ablest mechanical philosophers have devoted themselves to illustrating the friction of substances:—from Amontons (1699), through Coulomb (1781), Vince (1785), and Rennie (1829), down to Morin (1831-4), who, under the direction of the Government of France, made an elaborate series of experiments *on Friction*:—yet notwithstanding all the high intelligence, and the labor expended upon this important subject, the engineers who first came to apply the laws enunciated by the philosophers to the estimation of the frictions between metals under heavy insistent weights as they occur upon railroads, for instance, soon found themselves most wofully at fault.

Although Amontons, De La Hire, and Euler had assumed the coefficient of rubbing friction between hard bodies (without unguents,)

to be usually about $\frac{1}{3}$d of the insistent weight. Rennie, and other acknowledged authorities, had shown experimentally, that without unguents the rubbing friction between hard metals might "*very generally be estimated at about* $\frac{1}{6}$th *of the pressure*"*—but this (in Rennie's trials,) was with small insistent weights of less than 33 lbs. to the superficial inch of contact, and we may here say, that all the mechanical philosophers limited the deductions from their experiments "*within the limits of abrasion*"—and though Morin showed that all frictions without unguents produced some slight abrasion, this militates not against our generalization, as under the moderate insistent weights employed in the experiments, that abrasion was necessarily but little—too slight, indeed, to seriously affect results.

Morin's experiments (of which an able digest was published in this *Journal* for 1843), confirmed generally those of Rennie, but the applied weights were not at all adequate in magnitude to represent what we now term "*Railroad Frictions.*"

A reliance upon the results of these philosophers (accurate though they may be within their limited range), led at once to erroneous conclusions, when applied to the heavy frictions of railroads.

A brief illustration of this will suffice:—in 1838, Nicholas Wood, Esq., published in London a much enlarged and carefully revised and improved edition of his valuable and well known Treatise on Railroads—his own experiments therein cited (though made with too small weights,) showed $\frac{1}{6}$ to $\frac{1}{16}$ *adhesion* or *bite* of the wheels of locomotives upon rails; and this adhesion (it is well known) furnishes the fulcrum for their motion, and absolutely limits their progressive power.

Nevertheless, Mr. Wood in the standard work referred to, finally concluded to assume only $\frac{1}{15}$ of the insistent weight as the *effective adhesion* of a locomotive clear of that necessary to move itself!

To show the anomalous condition of the science of friction at that day (1838), though more than four years subsequent to the publication of the bulk of the celebrated experiments of Morin, and nine years subsequent to those of Rennie, we may state, as a curious fact, that in the very same year (1838), one of our ablest and most experienced American civil engineers (B. H. Latrobe, Esq.,) in his famous Report upon the location of the Baltimore and Ohio Railroad, assumed (as the result of experience here) $\frac{1}{7.5}$ as the coefficient representing the *effective adhesion* of a locomotive engine.

We see, then, that upon opposite sides of the Atlantic ocean, at the same moment of time, two of the highest authorities on railroad subjects (both thoroughly acquainted with the accepted laws of friction), were founding the most vital and important conclusions upon *the adhesion of locomotives;* and yet the English authority was assuming that adhesion to be only $\frac{1}{15}$ of the weight upon the driving wheels, while our American authority (as the result of actually existing experience here,) stated it at $\frac{1}{7.5}$, *or precisely double!* And we may here add (with pleasure,) *that Mr. Latrobe was much the nearest right.*

At a long subsequent period (1853), Mr. Latrobe found by careful

* Vol. 119, Philos. Transac., 1829, p. 160.

trials at the opening of the mountain division of the Baltimore and Ohio Railroad, that the performance of the heaviest class of locomotives, with full loads upon the 105 and 116 feet ascending grades of that well known railroad, showed an adhesion in actual work of nearly $\frac{1}{3}$. And in support of this, we may state, that the working of fully loaded locomotive engines on other roads has now shown conclusively, that at low speeds in the haulage of heavy freight we may fully rely *upon an average adhesion of $\frac{1}{6}$ of the weight upon the driving wheels of a locomotive;* while under favorable circumstances an adhesion of $\frac{1}{5}$, or even more than $\frac{1}{3}$, will be developed, in defiance of *the maximum of friction* having been fixed by modern writers at $\frac{1}{6}$th.

The late W. R. Casey, Esq., (a civil engineer of eminence,) in an able article published in the *American Railroad Journal* (Sept. 15, 1839), was the first to draw the attention of professional men to the fact that we were largely *under-estimating the maximum adhesion of locomotives;* and he showed conclusively that even in 1836, Baldwin's and Norris's American locomotives had already realized an adhesion of between $\frac{1}{4}$ and $\frac{1}{3}$ of the weight imposed upon their drivers!

These, and other facts, clearly indicated that the laws of friction, as then accepted by the mechanical world, were inadequate to guide us in the new frictions developed by the application of steam power to railroads; and the uncertainty existing in the minds of even professional men, as to the true coefficient of friction, developed by the adhesion of a driving wheel upon a rail, accounts in part for the astonishment with which many engineers witnessed the ascension by locomotives of inclined planes, previously worked by stationary power, and this uncertainty doubtless had its weight in inducing a leading English engineer, (Prof. Vignoles,) even so late as 1844, to name 1 in 50, or a gradient of $105\frac{6}{10}$ feet per mile, as the limit of grade which could be practically worked by locomotive power, though at the present day we know that upon the Baltimore and Ohio, and Virginia Central railroads, gradients of 1 in 20, and even 1 in 10, have (temporarily) been successfully surmounted by locomotives, with passengers.

For the very important discrepancies which are found between the railroad frictions, actually developed by practice, and what they should have been, had they followed the laws laid down by Rennie and Morin—the writer has endeavored to account, (without invalidating the labors of either,) by remarking that all the experiments upon the friction existing between metals in motion, from which the mechanical philosophers have deduced their governing laws of friction, were made *within the limits of abrasion*, and were usually stopped so soon as the metals began to *abrade* each other—while, on the other hand, all railroad frictions are destructive frictions, or those in which the metals in contact *constantly abrade each other.**

It will be seen, then, that the ordinary experiments upon friction are inapplicable to some of the most important *railroad frictions*, and hence there would seem to be a real necessity for further experiments, under the actual circumstances which occur on railroads, or at least

* See Journal of the Franklin Institute for March, 1851, page 152.

with such great weights, and small surfaces of contact, as may more closely assimilate to them.

A somewhat similar view of this subject was taken by the writer, in an article in this *Journal* for March, 1851, in which he argued the probability, that (contrary to the received laws of friction), under great insistent weights and small surfaces of pressure, as between the driving wheels of locomotives, and the rails on which they move, there was strong reason to believe *that friction increased in some ratio to the surface pressed.**

It will be remembered that Rennie and Morin both concur in laying it down as a law, that friction is always "*proportional to the pressure*," irrespective of the extent of surface pressed or of velocity, and that this is almost universally accepted by the mechanical philosophers of our day, (though recent French experiments indicate that velocity should not be neglected;) if then it can be established that within the important range of railroad frictions, whether owing to abrasion, or any other cause, "*friction actually increases in some ratio to the surface*," and not wholly irrespective of it, (as now taught,) important consequences can hardly fail to flow from such conclusion, and the necessity of further experiments to establish the laws of *abrading frictions*, between metals in motion, will become apparent.

In his article of 1851, the writer said: "When engines slip their wheels on railways, both wheels and rails *abrade*, the law of friction changes, and we enter at once upon a new field, in which we have no exact results recorded, and of which we only know that the coefficient of friction is greatly increased."

The writer had frequently computed the *adhesion* of locomotives from actual loads drawn by them on railways of known grade, and like other engineers had found, that the adhesion exhibited, far exceeded the extreme limit of $\frac{1}{6}$, laid down as the *maximum* by Rennie and Morin; and he had also noticed that fully loaded locomotives, in passing from broad to narrow rails, *invariably slipped their wheels, upon striking the narrow rail;* and hence, in the article of 1851, he inferred that the adoption of rails of the top width of the available wheel tread, (say 4 inches,†) would largely augment the ascensive power of locomotives on high gradients;—since then a striking fact has been made known, which seems to confirm, in a conclusive manner, the accuracy of the views then taken, on this important point in railroad affairs.

The fact referred to, has been developed in the working of the Mine Hill and Schuylkill Haven Railway, a heavy coal road; the Chief Engineer of this work, R. A. Wilder, Esq., (an able and experienced officer,) states to the editor of the *New York Railroad Advocate*, (see No. 22,) that upon his road a 92 feet grade laid with narrow topped rails, is immediately succeeded by a 130 feet gradient, on which rails of full width are placed, and in the working of this road with heavy coal trains, "it is found that an engine can draw more (ascending)

* In the article referred to, an error of the press made the writer say, "in the same ratio to the surface," instead of "*in some ratio to the surface*," as he wrote at the time.

† Some able engineers, as William Parker, Esq, and J. W. Brooks, Esq., have advocated, and to a limited extent have used, rails 3 inches wide on top, though with a different object in view.

upon the 130, than on the 92 feet grade, although the actual resistances on the former grade are full 33 ℔ cent. greater than on the latter." We quote here the words of Zerah Colburn, Esq., the well-known editor of that excellent railroad paper; and we think he might fairly have estimated the resistances upon the 130 feet grade, as being full 40 ℔ cent. over those of the 92 feet gradient, since gravity alone upon the former, would amount to 55 lbs., and on the latter to only 39 lbs. per ton of 2240.

In observing various of the frictions connected with railroads, the writer has been irresistibly led to the conclusion, that friction between metals, under heavy weights, must increase in some ratio to the surface pressed, or to the weight imposed, or to the velocity, or in combined ratio of the three;* and he is glad to find, that many intelligent mechanics (struck by the anomalous results of our present theory of rubbing friction, when great weights or severe pressures are in action), are beginning to entertain similar views.

It is a singular fact, that one of the series of Rennie's experiments, (Table viii, p. 159, 119th vol. *Philos. Transac.*, 1829,) although evidently regarded as anomalous by him, nevertheless sustain fully, as far as they go, some of the views above expressed; made under much heavier weights, in proportion to the surface pressed, than in Rennie's other experiments, and pushed in some instances up to or beyond the limits of abrasion; they represent more nearly the conditions of railroad frictions, and they give far higher coefficients for the friction of iron on iron, without unguents, than any other of Rennie's experiments; these coefficients augmenting with the weights imposed, varying from $\frac{1}{2.4}$ to $\frac{1}{4}$, and averaging $\frac{1}{3}$! Nevertheless, Mr. Rennie, in his general conclusions, while deducing the laws of friction from his experiments, passed almost unnoticed over this remarkable table (No viii), and assumed the rubbing friction between hard metals without unguents, as being only $\frac{1}{6}$, whilst in no single instance of iron on iron recorded in that table, was the coefficient of friction less than $\frac{1}{4}$th!

In the trials recorded in this table (No. viii), the insistent weights varied from 186 to 560 lbs. per square inch, and the coefficients of friction with the same surface in action, (6 square inches,) constantly augmented with the weights from $\frac{1}{4}$ with the former, to $\frac{1}{2.4}$ with the latter pressure! So that it may ultimately prove, that a correct formula for friction in such cases, may have to involve both weight and surface, and perhaps also time and velocity, instead of being in ratio of the weight alone, irrespective of time, surface, or velocity, as laid down by Rennie and Morin.

But even the highest pressures used by any of the experimentalists are but small, when compared with those imposed in the working of railways, upon the driving wheels of locomotives, on each of which 4 tons in this country, and 6 tons in England, are common weights.

Now, if in consequence of unavoidable deflections in the track, we admit that the practical bearing of a locomotive wheel upon a rail, may

* Professor Renwick (1832) recognised the necessity of this, and proposed a formula, embodying *pressure, surface, and velocity*. See Renwick's Mechanics (p. 120).

be so much as $\frac{1}{2} \times 2$ ins., we have only one square inch of surface of iron to resist an imposed weight of from 8960 to 13,440 lbs!

No such weights per superficial inch have ever been used by the mechanical philosophers in their general experiments upon friction, and therefore none of these can fairly be said to represent the conditions of *railroad frictions;* for in these frictions the comparatively enormous weights applied render *abrasion* certain and unceasing, while in deducing the general laws of friction, the experiments which involved material *abrasion* have been uniformly set aside.

Mr. Casey, in the article before quoted, has shown that it is quite probable the *adhesion* of locomotives in certain cases has even exceeded $\frac{1}{2}$, and every engineer knows that it very often far exceeds $\frac{1}{6}$, though the latter is the *maximum* coefficient allowed by those experimentalists who are now recognised as being the highest authorities upon the laws of friction; further experiments are therefore unquestionably necessary to settle this important point in the science of mechanics, and it is to be hoped that they may soon be undertaken upon a suitable scale.

Although Rennie and Morin (on whose experiments the usually accepted laws of friction are mainly based,) decided unequivocally, that the coefficient of friction depended solely upon the pressure, "without regard to surface, time, or velocity;" nevertheless, an earlier philosopher (Dr. Vince), whose experiments were well known to both, had shown (vol. 75, Philos. Transac., p. 175), that "the friction of a body does not continue the same when it has different surfaces applied to the plane on which it moves, but that the smallest surface will have the least friction," and this is to be understood as within the limits of abrasion.

Notwithstanding Dr. Vince's conclusions have usually been disregarded by modern philosophers upon the ground that his experiments were on a scale too limited to establish mechanical laws; nevertheless, it would appear quite probable, that under certain circumstances the deductions of Dr. Vince may be found the most correct, as scarcely any branch of mechanical science is based upon experiments so anomalous in their character as those from which the usually received laws of friction have been inferred by a generalization *evidently forced.*

Nor is this observation too strong, when we recollect that Rennie, after showing by table No. viii of his paper, that iron on iron, without unguents, and with only ordinary pressures, had a friction of over $\frac{1}{3}$, yet finally adopted a frictional coefficient for this very case of only $\frac{1}{6}$th!

Morin in another case, that of hard woods with unguents (to which we shall again refer), adopted $\frac{1}{6 \cdot 2}$ as the coefficient of the friction of rest, and $\frac{1}{13 \cdot 7}$ as that of motion; whilst the experiments made upon a large scale by a Committee of the Franklin Institute, showed that these coefficients were in reality *less than half as great as those announced by Morin!*

The writer will now refer more particularly to some striking anomalies in the friction of heavy weights on wood, *with unguents*, which are remarkable as indicating the inaccuracy of some of Morin's coeffi-

cients, when applied on a great scale to heavy masses in motion upon lubricated wood.

In vol. vii of the 3d series of this *Journal*, p. 103, will be found an elaborate Report by a Committee of the Franklin Institute (of which the present respected President of the Franklin Institute was chairman), on the coefficients of friction developed at the launching of the U. S. war vessels, the *Raritan* (a heavy frigate), and the *Princeton* (a large war steamer)—they show conclusively that *the friction of rest* of these vessels upon wooden ways, well lubricated with *tallow*, was about $\frac{1}{15}$, while the *friction of motion* was about $\frac{1}{30}$th. Now, Morin (as above stated,) gives a coefficient nearly as high as $\frac{1}{6}$ for the former and $\frac{1}{14}$ for the latter; the differences being *over one hundred per cent.* Had Morin been correct these vessels would not have launched at all, instead of moving off as they did of themselves the moment the stay blocks were sawn asunder.

The *Raritan* was estimated to weigh 1200 tons, and her pressure on the ways was 3560 lbs. per square foot, while the *Princeton* weighed 577 tons, and had a pressure on her launching ways of 2280 lbs. to the superficial foot.

These conclusions of the Franklin Institute, notwithstanding their extraordinary variance from the coefficients of Morin, are in close accordance with similar experiments in England and France, as quoted by Rennie (vol. 119, Philos. Transac., p. 155), where the *Salisbury*, a frigate of 58 guns with a pressure of 6336 lbs. per square foot upon her launching ways, and *soft soap* for the lubric, had a coefficient of friction of $\frac{1}{26}$th—while for similar cases, with *hogs'-lard* for the unguent, and a pressure of 7056 lbs. per square foot, Coulomb made the coefficient of friction $\frac{1}{27}$th, and with *tallow*, Coulomb made this coefficient $\frac{1}{28}$th.*

We may therefore conclude, that whether with hard metals without unguents, or with hard woods lubricated with the usual lubrics—as in the adhesion of locomotives in the former, or in the launching of men-of-war in the latter case—Morin's coefficients of friction *are entirely inadequate* to represent the facts, being in the case of *adhesion* but half as great as practice indicates; while in that of *launching ships* they err the other way, being twice too large!

It is quite probable, that the recent extraordinary difficulties attending the famous launch of the *Leviathan*, arose from an under-estimate of the friction of abrading surfaces of iron, of which the coefficient under the circumstances doubtless exceeded $\frac{1}{3}$, while if our recent books were relied on, it would have been assumed at $\frac{1}{6}$—a difference great enough, in such a vast weight, as to have created all the difficulty and extra cost which attended that celebrated launch, and called forth all the resources of the distinguished engineer in charge.

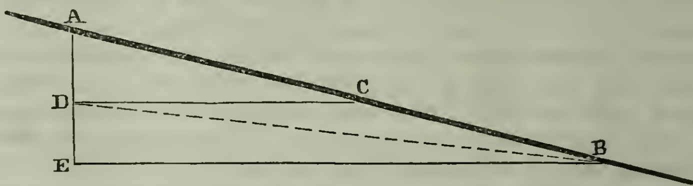
We can hardly therefore avoid the conclusion, that the laws of friction as now received, if applied to the heavy pressures often used, *are entirely inadequate, and that further experiments are necessary to the correct solution of many practical problems.*

*See Renwick's Mechanics.

Should any such be undertaken, the writer would suggest that a long inclined plane be used, and great sliding weights, so as to assimilate the case to that of launching ships—then by an automatic contrivance, such as was devised by that able mechanic, Joseph Saxton, Esq., and used by the committee of the Franklin Institute at the launches of the *Raritan* and *Princeton*, the exact motion of the body under trial, in seconds, or parts of seconds, could be correctly marked upon a tape, and the following simple formula, (drawn up at the time by the writer, as a member of the committee referred to,) will determine the coefficient of the friction of motion, of rest, (by taking the space described in the first, second, or half second,) or of both combined.

We here re-print, with some slight modifications, the following note to the Report of the Committee on the Launches, which was drawn up for them by the writer, and exhibits a simple formula for determining the friction of inclined planes, as well as a graphic mode of representing the inclination of the plane of the friction of motion, or angle of friction:

"Another method of considering the subject of friction, upon inclined planes, has been suggested by a member of the committee, which results in a formula different from that we have employed.



Thus calling A C$=$S, the space actually slid over in a given time, t, by any body descending an inclined plane.

A B$=$S′ the space which the body would have described by theory in the given time, $t=\frac{1}{2}gt^2$ sin. i, friction being null.

A B E$=i$, the angle of inclination which the plane forms with the horizon.

D B E$=f$, the angle of friction due to the body in motion.

"Then A E, being the total vertical space through which the body would have fallen in the given time, t, if friction had not existed; and A D, being the actual vertical space fallen through in the given time, t, it follows that D E represents the retardation due to the friction of the body upon the plane A B. D B E will be the angle of friction of the body, and $\frac{\text{D E}}{\text{B E}}$ will be the tangent of the angle, f, or coefficient of the friction of motion pertaining to that body.

"Knowing then simply the actual time occupied by the sliding body, in descending any measured distance along the plane, the formula, for finding the coefficient of its friction, will be

$$\text{Tang.}\,f=\text{Tang.}\,i\left(\frac{\text{S}'-\text{S}}{\text{S}'}\right)$$

which represents all the resistances encountered by the moving body.

"By this formula the angle of friction of the *Raritan* frigate, computed from a time of 11 seconds, occupied in sliding 59 feet, upon a slip of 3° 40′ slope, is 1° 55′, the coefficient of friction, or natural tangent, of that angle being ·0336, or nearly 1-30th.

"The angle of friction of the *Princeton* steamer, computed by the same formula, from a time of 5¼ seconds, occupied in sliding 19·62, feet upon a slip of 4° 25′ slope, is 1° 53′,

the coefficient of friction, or natural tangent, of that angle being ·0328, or rather more than 1-30th.

"The mean of these two results, gives an angle of friction, for launching such vessels as these, of 1° 54′, or a coefficient of friction of very nearly 1-30th."

So that the angle of the friction of motion in launching men-of-war, may be fairly assumed at 2°, and the proper declivity of the launching ways at 4°.

We cannot conclude this article without referring in terms of commendation to the old experiments on friction made in the last century by Coulomb, Vince, and Ximenes*—and although these have been lightly laid aside by more recent philosophers, they seem in fact to be much more applicable to practical affairs, than the more elaborate experiments of Rennie and Morin.

Road Paving.†

To the Editors of the Mechanics' Magazine.

GENTLEMEN:—A letter under this head appeared in your last valuable number, from Mr. Holland, of Woolwich, recommending alternate rows of stone and wood as affording a good foothold for horses, and constituting a most valuable improvement in street paving.

Your correspondent will find his sensible suggestions carried out in some paving I recently laid down at the Holborn end of Little Queen street, by the authority of the District Board of Works.

This improved system has been in operation for some years, and I am enabled to state that it not only affords a good foothold to horses, but it possesses the other valuable advantages of freedom from mud, dust, and noise, and, being cast in blocks of large dimensions, affords great facility for access to the water and gas mains.

I remain, gentlemen, your obedient servant,

FRED. BRAITHWAITE.

46 Berners street, June 9, 1858.

[We cannot allow the above letter to pass without adding a few words respecting the paving which our experienced correspondent here brings to our notice, especially as he is eminently well qualified to pronounce an opinion upon the subject, having acted as a Member of the Council of the Institution of Civil Engineers for many years, and as a Commissioner for a large London paving district in St. Pancras. The patent composite paving referred to by Mr. Braithwaite, is a composition of creosoted wood and broken Guernsey granite, cemented together in alternate rows with mineral asphalte, and cast into blocks 24 inches in length by 15 wide and 8 deep. They may, however, be moulded into any other shape or size, and may be entirely composed of broken granite, as some of the blocks in Little Queen street now are, for the satisfaction of those Commissioners who have an objection to wood in any shape or form. It has been found, nevertheless, that, however objectionable wood in its natural state is admitted to be as a material for paving by itself, its introduction in conjunction with these

* For an excellent summary of these, see Renwick's Mechanics.

† From the London Mechanics' Magazine, June, 1858.

blocks, when rendered impervious to water by creosote, constitutes a very valuable feature in the improved system. The blocks, when laid down to a proper curve, and when their joints have been run in with asphalte, form an arch capable of sustaining the heaviest traffic; and being impervious to water, provide most effectually against noxious emanations from gas mains and putrid sewers, by which the inhabitants of the metropolis have been of late so frequently afflicted. The blocks can be taken up to get at gas and water mains, and relaid with greater facility than any others now in use, and they never can sink into ruts as the narrow granite blocks recently introduced frequently do, when acted on by wagon wheels.

In a report made on the 10th of May to the Commissioners of the Holborn Board of Works, Mr. Braithwaite speaks very highly of the composite paving, pronouncing it superior to every other paving material that has come under his notice, and entering at considerable length into a statement of its advantages. After adverting to its general excellence, he says:—"The substitution of machinery for manual labor in the manufacture of these composite blocks is another feature which I find very important in an economical point of view, as a given number of square yards of this paving can be prepared and laid down in as many hours as days are now required for granite blocks." He then contrasts the new system with that of Macadam, and asserts that the former gets rid of many of the evils of the latter, adding:—"The most satisfactory evidence that can be adduced in support of this fact is that a specimen of this (the new) system which I have seen in a coal merchant's yard at Greenwich, where it has been for upwards of three years exposed to the heaviest traffic without requiring any repairs, while the adjoining Macadam required to be renewed every two or three months, in order to keep it on a level with these composite blocks; and I can also advert to the specimen laid down in Southampton street, where similar frequent renewals of the Macadam were required, and where, notwithstanding the Pickford vans and other heavy traffic proceeding along this street from Holborn to the Euston square Railway Station, including during a portion of that time the whole of the traffic of Holborn itself, while that great thoroughfare was being repaved. I could not discover, on measuring these blocks, that there was a greater reduction in any of them by this wear and tear, than from an eighth to a quarter of an inch, nor any symptom of a rut or hollow on the surface of any of them. . . . . . Another advantage to rate-payers, as well as to inhabitants, in an economical as in a sanitary point of view, must be obvious from the material diminution of such nuisances as mud, dust, and watering carts."

We have been induced to extend these remarks thus far, because during the last week or two the obstructions occasioned by the renewing of the common street paving have been so great in some of the most crowded thoroughfares of the city, that a satisfactory method of reducing the evil thus occasioned deserves the utmost encouragement.—Eds. M. M.]

*On the Resistance of Tubes to Collapse.** By WILLIAM FAIRBAIRN, Esq., C. E., F. R. S., &c., &c.

(*Continued from page 151.*)

[Read before the British Association.—Section G.]

The next series of experiments were of a different character—more approaching to actual practice; and, in order more fully to confirm what had already been laid down, tubes were made of larger diameter, and of plates six times the thickness. The first were of an elliptical form—one constructed of thin plates ·043 inch thick, and the other of plates $\frac{1}{4}$ inch thick. The axes of the transverse section of the first were 14 and $10\frac{1}{4}$ inch, and of the second $20\frac{3}{4}$ and $15\frac{1}{2}$ inch. The thin tube was 5 feet long, and the $\frac{1}{4}$-inch plate tube was 5 feet 1 inch long. These being duly prepared were submitted to the usual test, and the first collapsed with $6\frac{1}{2}$ lbs. on the square inch, and the second with only 127 lbs. on the square inch.

On comparing the elliptical tube, whose longer diameter was 20·75 inches, and its conjugate 15·5 inches, with the cylindrical tube T in the next table, of 18·75 inches diameter, and of the same length, thickness of plates, and nearly of the same sectional area (the sectional area of metal on the elliptical tube being 14 inches, and in the cylindrical $14\frac{1}{2}$ inches,) we have for the collapsing pressure of the elliptical tube 127·5 lbs. to the square inch, and 420 lbs. for that of the cylindrical tube, where it will be observed that there is a loss of more than $\frac{2}{3}$rds, or of nearly $\frac{5}{7}$ths the strength; or, in other words, a cylindrical flue will sustain three times the pressure that could be supported by an ellipse of the same weight of metal, and proportioned like tube S.

From these facts it is obvious that in every construction where tubes have to sustain an uniform external pressure, the cylindrical is the only form to be relied upon, and that any departure from the true circle is attended with danger.

In order to ascertain the different powers of resistance of tubes composed of thick plates and of different diameters, a strong tube only 9 inches diameter, and formed of $\frac{1}{4}$-inch thick plates, was constructed to match and compare with the tube T, also of $\frac{1}{4}$-inch plates, but $18\frac{3}{4}$ inches diameter. The 9-inch tube was, however, found to be considerably beyond the retaining powers of the cylinder, which it would not have been safe to have trusted above 500 lbs. on the square inch. Finding the strength of the small tube too great for the containing vessel, two new tubes were made—one with a lap-joint, as at A, in the annexed sectional figure, and another with a butt-joint, as at B. These tubes were made of plates about $\frac{1}{8}$th of an inch thick, the object of this difference being to ascertain to what extent the resisting power of the tube was reduced by the lap-joint. In the construction of boilers the lap-joint is almost invariably in use; and it must at once appear obvious that any departure from the true circle in cylindrical tubes must injure their powers of resistance to compression.

* From the London Artizan, October, 1857.

The tube V, experiment 25, was made with a lap-joint, which caused it, as already remarked in ordinary constructions of boiler-flues, to depart from the true circle to the extent of nearly $\frac{1}{4}$ inch the thickness of the plates. In the tube W, experiment 26, the cylindrical form was better maintained by the butt-joint; and after careful measurement with the callipers, the difference between the two, as respects the cylindrical form, was 14 inches. This comparatively small difference had, nevertheless, a serious effect upon the resisting powers of the tube, which, according to the results in the above table, caused a loss of more than one-third of the strength of the tube, the difference being as 262 for the lap to 378 for the butt-joint, or in the ratio of 69·3 : 100, or as 7 : 10 nearly. These facts are so conclusive as to point to an entirely new construction in the manufacture of tubes calculated to sustain an uniform external pressure, and the results are so conclusive as to show the necessity of adhering in every construction of this kind to the *true cylindrical form.*

During the investigation of the question of the comparative resisting powers of tubes to collapse, another one of probably equal importance arose as to the relative powers of cylindrical tubes to resist internal force acting uniformly over their surface. It has already been demonstrated that the resistance of cylinders to internal pressure is directly as the diameters; but what effect the length may have upon the strength of a tube has yet to be determined. We have already seen that a cylindrical tube, when subjected to external pressure, loses one-half its powers of resistance when the length is doubled. Hence arose the question, what effect, if any, will an increase of length have upon a tube exposed to internal pressure? To solve this problem, three tubes of precisely the same diameter and same thickness of plates, but of different lengths, were prepared and submitted to the test of experiment as follows:

TABLE VII.

Resistance of Tubes with Lap and Butt Joints.

Marks.	No. of experiment.	Diameter of the tube.	Length of tube.	Thickness of plates in parts of an inch.	Pressure of collapse in lbs. per sq. in.
		ins.	ft. ins.		
U	24	9	3 1	·25	—
V	25	9	3 1	·14	262
W	26	9	3 1	·14	378

TABLE VIII.

Resistance of Tubes to Internal Pressure.

Marks.	No. of experiment.	Diameter of the tube.	Length of tube.	Thickness of plates in parts of an inch.	Pressure in lbs. per sq. inch, to produce rupture.
		ins.	ft. ins.	·043	
X	27	6	4 0	·043	375
Y	28	6	2 6	·043	230
Z	29	6	2 0	·043	235
&	30	6	1 0	·043	475
Aa	31	12,13	5 0	·043	110

Considerable discrepancies occur in the experiments on internal pressure, as the whole of them gave way at the riveted joints. Every precaution was taken, by careful riveting and brazing, to render them as

nearly uniform in strength as possible, but nevertheless they strengthen the conclusions arrived at some years since, that the strengths of riveted joints of malleable iron plates, are nearly as the numbers

100 for the plate,
70 for double riveted joints,
50 for single riveted joints.*

These experiments pointed out that riveted joints reduced the ultimate strength of boilers in the ratio of the metal punched out for the reception of the rivets, as shown in my recent publication, entitled "Useful Information," new edition, p. 36.

This constant failure at the joints renders the experiments on internal pressure less satisfactory, as they do not exhibit the ultimate strength of the plate, but the strength of the joint of which the tubes were composed. Jointed tubes and flues are almost always present in boiler constructions—the small tubes of locomotive, marine, and multitubular boilers being the only ones which are without joints; hence these facts are probably not less important when applied to such constructions.

On a careful examination of the fractures, the tube X, 4 feet long, seemed the most perfect; Y was not so well soldered, and burst, by tearing off the heads of the rivets; and Z was partly torn through the plates and partly through the rivets. The plate of which this tube was composed was, however, exceedingly brittle, and broke like cast iron. Tube Aa was ruptured in the same way and in the same direction as the others; the rivets were torn through the plates, and the soldering, not very sound, was ripped up for 10 inches along the joint: this tube, as also Y and Z, would have borne a greater pressure had the joints been more perfect and of sounder workmanship.

Taking into account the above discrepancies, it will be impossible to deduce any formula, or establish any result calculated to direct our practice as to the effects produced upon the resisting powers of tubes, when the length is increased; comparing, however, the tube, &c., 1 foot long with the tube X, 4 feet long, and assuming that the joints were equally perfect in each, it is evident that the shorter the tube the greater its powers of resistance. This may arise from the ends being perfectly rigid and unyielding, which, in short tubes, would reduce the pressure upon the middle and unsupported portion in a given ratio of the length of the tube. For example, let us take two tubes of any given diameter, the one 10 feet and the other 20 feet long; it is evident that it is much easier to force the long tube into the form of a barrel, as *a a*, Fig. 2, than it would be to produce the same form in the shorter tube, as at

Fig. 2.

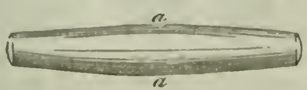
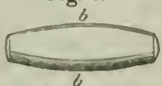


Fig. 3.



b b, Fig. 3. To prove this, let us suppose the material to be perfectly elastic, and capable of extension, such as a tube of vulcanized India rubber, or any other elastic materials, and we have at once the solution

* "Philosophical Transactions." Part II., 1850, p. 677.

to the question, that the extension does not take place at the ends, but in the middle, where the particles of the material possess diminished resistance, arising from their respective distances from the ends or points of support.

To ascertain how far this view is correct, two lead pipes were prepared of 3 inches diameter, and of the respective lengths of 1 foot $2\frac{1}{2}$ inches, and 2 feet 7 inches; and these were submitted to the following experimental tests:—

TABLE IX.—*Resistance of Lead Tubes to Internal Pressure.*

Marks.	No. of experiment.	Diameter of tube.	Length of tube.	Thickness of metal in ins.	Pressure to produce rupture in lbs. per sq. inch.	Remarks.
		ins.	ft. ins.			
Ab	32	3	1 $2\frac{1}{2}$	·25	225	With 225 lbs. pressure one of the ends was blown out.
	33	3	1 $2\frac{1}{2}$	·25	374	Burst with 374 lbs.; but before rupture the tube had assumed the barrel form, as at Ab, and on measuring the circumference, the metal had elongated $1\frac{1}{4}$ ins.
Ac	34	3	2 7	·25	325	
	35	3	2 7	·25	364	

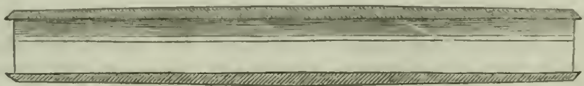
The tube Ab ruptured at the thin part of the metal, the water bursting through a narrow slit about 3 inches long. The lower end of the tube Ac was also blown out with a pressure of 325 ℔s., and after being repaired and secured by bolts and clasps, it was eventually ruptured with a pressure of 364 ℔s. on the square inch. The same amount of elongation of the material was observed in this as in the shorter tube—namely, $1\frac{1}{2}$ inches, and the only difference was in the position of the enlargement of the diameter, and the fracture, when the tube gave way, represented by a thin, narrow slit.

It is probably difficult to assign the reason why cylindrical tubes of uniform texture should follow the law indicated by the experiments, as that of beams or hollow tubes, circular or rectangular, subjected to a transverse strain. Where the force or pressure is applied on the principle of equal distribution, that is, where the load is uniformly distributed over the surface of the beam or tube, or, what is the same thing, when one-half that force is applied to the centre, it requires greatly increased strength in the middle, and greater rigidity, to equalize the pressure, and to make the beam or tube equal in its powers of resistance in all its parts. If, for example, we make a circular or rectangular tube of uniform thickness throughout its whole length, it will be found that on loading it in the middle, or with double the load equally distributed over the surface, with a weight sufficient to break it, that it will yield in the middle, or the most distant point from the ends on which it is supported. This point being the most distant from the centre round which the forces revolve, is acted upon with greatly increased force, and consequently requires a proportionate increase of strength.

To render, therefore, a perfectly uniform tube in diameter equal in

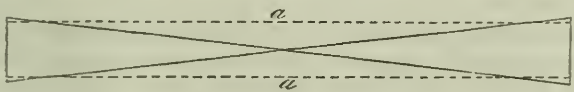
its powers of resistance to an equally distributed external pressure over the whole of its surface, it would require it to be constructed in the form given below (Fig. 4), where the thickness of the material in the middle is duly proportioned to the length of the cylinder, and that upon the same principle as that which applies to beams subjected to a transverse strain. Were it otherwise, the tube would collapse in the

Fig. 4.



middle; and supposing perfect uniformity in the thickness of the material throughout the whole length of the tube, collapse would ensue in the middle, and would take the form indicated at *a a*, Fig. 5, the weakest point, where the greatest force of collapse must of necessity ensue. On this principle of construction we are obviously defective; and it is quite evident, that in every case where it is desirable to have uniformity of strength in all parts of a tube intended to resist uniform

Fig. 5.



external pressure, we must either thicken the circumference proportionally along its length, the thickest part being in the middle, or we must use the simpler means of surrounding or hooping the tube by external rings that will increase the power of resistance in the ratio of the length of that tube. This has all along been indicated by the experiments; and having thus ascertained the law of resistance of tubes to the forces thus applied, we must of necessity follow that law in all constructions where the pressure is uniform and equal over the whole surface of the tube.

Summary of Results relative to the Resisting Powers of Tubes of different lengths.

Reasoning upon the results derived from the experiments upon the 4 inch tubes, we find the force of collapse follows the same law as those contained in the experiments on the 6 inch and other tubes. Thus, taking the results given in Table I, in which the tubes are of the same thickness, and of 4 inch diameter, we find that the pressure of collapse varies according to the length of the tube, as follows:

Diameter.	Length.	Collapsing pressure.	
4	19	170	mean, 153·5
4	19	137	
4	40	65	" 65·0
4	38	65	
4	60	43	43 0

From the above, we deduce that the resistance of the 4 inch tubes

varies inversely as their lengths, and this law we have found confirmed by all the other experiments. Thus, for instance, assuming that the lengths of the tubes in the above table were 20, 40, and 60 inches, and that the resistance of a 40 inch tube is 65 lbs., we find by the law that the resistance of a 20 inch tube would be 130, and that of a 60 inch tube would be 43 lbs. per square inch; and these calculated results correspond nearly with the pressures as indicated by the experiments, and given in the table. In conducting experiments of this kind, it is next to impossible to form tubes, where the joints have to be soldered and riveted, theoretically correct, and certain allowances must therefore be made for discrepancies which must of necessity occur in their powers of resistance to strain. It is nevertheless obvious, that after making these allowances for inaccuracies of construction, the results of the experiments approximate so near the truth as to afford unmistakable evidence that the tubes follow the same law in their resistance to collapse as a hollow beam supported at each end and subjected to a transverse strain, the strength in each case varying inversely as the length; or, in other words, a tube 10 feet long will resist twice as great a pressure as a tube 20 feet long of the same dimensions, and so on for every other length, the resistance being inversely as the increase of that length, probably until the tube attains a length equivalent to the resisting powers of the material of which it is composed.

To what extent the length may be increased before this law ceases to act, is a question yet to be determined. For the present, however, there is sufficient data to show that any increase to the length of a tube within certain limits has a serious effect upon its ultimate strength, and its powers of resistance to strain. This is an important question, and one which affects the strength of all descriptions of pipes and tubes; and it would be interesting to know to what extent a tube of any given diameter could be carried before it began to deviate from the law of resistance which governs the shorter lengths. If, for example, a tube 8 inches diameter, and 1 foot long, collapse with a pressure of 100 lbs. on the square inch, what force would be required to collapse a tube 100 feet long? Now, it is clear from the experiments, that a similar tube 5 feet long would collapse with 20 lbs., and it is equally clear that the same pipe extended to 100 feet in length would not collapse with a pressure of 1 lb. That pressure would certainly be insufficient, as it would require considerably more than a pressure of 1 lb. to destroy the elasticity of the material and produce a permanent set; or, in other words, to force the material out of the true circle.

Having arrived at the conclusion that the strength of tubes composed of metallic plates are in their powers of resistance to external pressure inversely as their lengths, we have now to consider the relation they bear to each other in regard to their diameters. It has already been demonstrated that the strengths of cylindrical tubes, subjected to internal pressure, are inversely as their diameters, and that a tube 2 feet in diameter will sustain double the force required to rupture a tube 4 feet diameter: that is, if the lengths and other dimensions be the same. Bearing this in mind, namely, that the strength of tubes

vary inversely as their lengths, we shall find, on the other hand, on comparing the experiments, in regard to an external compressive force, that they also vary inversely as their diameters.

For example, let us take the 4 inch tubes and compare them with the 8 inch. Taking those of 39 inches long, of which the 4 inch collapsed with 65 lbs., and the 8 inch with 32 lbs., we find by the above law, that as 8 : 65 : : 4 : 32·5, the calculated pressure differing from the experimental by 0·5 only. Again, compare the 4 inch tube, 5 feet long, which collapsed with 43 lbs., with the 6 inch tube, 4 feet 11 inches long, 6 : 43 : : 4 : 28·7, which is 3·3 lbs. less than the experimental pressure; or, taking the 12 inch tube, 12 : 43 : : 4 : 14·3, which is only 1·8 lbs. over the pressure indicated by experiment 19. Again, let us compare the tubes of 2 feet 6 inches in length, assuming the mean of experiments 1 and 4 to be correct, and thence deducing the results for tubes of larger diameter.

Length.	Diameter.	Pressure of collapse by experiment.	Pressure of collapse by calculation.
2 6	6	50 mean	50·0
2 6	8	39 "	37·5
2 6	10	33 "	30·0
2 6	12	22 "	25·0

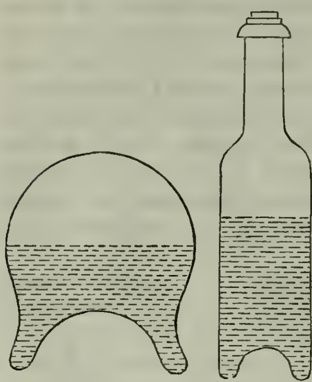
The differences are not great, and may be accounted for as arising from the imperfect construction of the tubes. It would appear, however, that the difference of strength is rather in favor of the smaller tubes, probably because they deviate less from the true cylindrical form. Taking, therefore, the whole of the experiments, and allowing for unavoidable discrepancies, which necessarily arise from imperfections of construction, we arrive at the conclusion that collapse of tubes from external pressure follow the law that their strengths vary inversely *as their length;* and, moreover, inversely as their diameters.

Conclusions to be drawn from the Experiments.

It is interesting to observe how closely nature approximates in her productions to the strongest and best forms. If we look at the tubular forms of grasses, bamboos, and other vegetable constructions of this kind, and taking to account the uses for which they were intended, we shall see that the form contributes greatly to their strength; and we shall, moreover, find that the shoots are telescopic, forming a series of concentric rings, arising from the formation of new and smaller tubes as they emerge in succession from those previously formed. As these again protrude and advance in growth, they leave behind enlarged hoops, or disks, of sufficient rigidity to support and sustain the form of the tubular structure. The same law which pervades natural productions should not be overlooked in art. We have ever before us the lessons of this first great natural teacher; and did we but consult her laws, and in all our applications endeavor to conform to the rules of a philosophy which never errs, and by which nothing is ever made in vain, we should, to use the words of our aspirations after truth, that Nature's laws, and the constructions derived therefrom, constitute the

only true system of philosophy by which we can attain the maximum of strength with the minimum of material.

The sphere is probably the only true form by which we can obtain uniformity of resistance to an uniform pressure, whether external or internal; and to approximate to this, probably, was the reason why our predecessors, from the days of the Marquis of Worcester to those of Watt, adopted the haycock or circular boiler with a hemispherical top and hemispherical bottom, as shown.



This was selected as the strongest form of boiler in the time of Newcomen and Beighton; and it was probably for a similar reason that the glass-blower forms the bottom of bottles with an elevated cone penetrating for some distance into the interior of the cylindrical part. This gives great strength to the bottle in resisting internal pressure, and at the same time reduces the quantity of liquid contained in the bottle; a consideration independent of strength, and probably a matter of no small importance to the retail dealers in wine and ardent spirits.

For the Journal of the Franklin Institute

On the durability of Tubes in the Pirsson Condensers.

By Joseph P. Pirsson.

Messrs. Editors:—My attention has just been called to an article in the *Journal of the Franklin Institute* for August, entitled "Steam and its Condensation, by Thomas Prosser, C. E.;" and in that article are several statements respecting the operation of my condensers, which I desire briefly to correct. These statements have reference chiefly to the durability of the copper tubes of which the surface portion has been generally constructed.

Mr. Prosser states, that "the copper tubes in the condensers of the *Arago* were worn out in less than two years. Those in the *Keystone State* gave out in an incredibly short time. * * * * * The *Fulton* fared no better, as regards her condenser tubes," &c.

The question of durability in the engines of a sea-going steamer is, of course, a highly important one, and in no part more so than in the condensers.

Want of durability in surface condensers had, until the advent of my invention, been the chief objection to their use; for in all previous attempts, this had been found to involve risks far greater than the advantages to be attained would warrant. The chief elements causing the destruction of the instrument, viz: pressure, and expansion and contraction, I have either totally eliminated, or rendered innocuous,

while I have also introduced an entirely new feature in the construction, and upon which only may surface condensation be safely employed. That new feature is the ability to resort to an alternative, in the immediate return to jet-condensation, in case of accident or other necessity. The question of durability in the "copper tubes," is reduced therefore to one of economy simply, since their destruction involves that of no element necessary to the working of the engine, and is consequently wholly unattended by risk of any sort.

When the tubes do give out, either in whole or in part, the only difference perceivable in the working of the engine is the loss of fresh water, in proportion to the extent of the defect, this being a feature belonging solely to my invention.

The question of the degree of wear in the surface portion of my condenser, is reduced to that of the selection of the most durable material, and has nothing whatever to do with the principle. The copper tubes at present in the condensers of the *Arago* are now far in the fourth year of their existence, performing in every respect as well as at first. The same is the case in the *Fulton*, the sister vessel. A few days since, the tubes of the *Augusta's* condenser were examined and found to be in perfect order, after about four years' use. The United States steamship *San Jacinto*, having my condensers on board, has just returned from a three years' cruise, and on examination the tubes were found to be in perfect condition, not having in the meanwhile been touched. Mr. Prosser is amused at the idea of there being any advantage in tinning the tubes. On this head I am not committed, one way or the other; and I will merely cite some facts as to the length of time the "tin will remain." I do this the more readily, as it will serve to explain the reason why tinning was resorted to at all. At the first introduction of my condensers, I had the misfortune to have several sets of tubes made from Lake Superior copper; for experience was wholly wanting then, as to what effect salt water would have upon this metal, as compared with other copper. It was soon found that it would not stand at all. The *Arago* had her *first set* of this copper, and it did not endure for even *two voyages;* and so too, with the *St. Louis.* These were replaced by *pure Spanish copper*, which has proved satisfactory in durability. Messrs. Merrick & Sons were the first to suggest tinning the tubes, with a view to prolonging their wear, and I believe first treated those in the *Quaker City* in that way, and other engineers have followed their example. Over four years ago I put into the *John L. Stevens*, 3000 ton vessel, and *Sonora*, 2400 tons, sets of condenser tubes of pure Spanish copper *untinned*. These, at late accounts, were still in good order.* Whether the tinning is of any material value, I am unable to say; I have, however, been in favor of it. This fact has been proved beyond question, viz: that the condensation is not injuriously affected thereby; while, so far as my observation extends, the tin also adheres to the copper to the last. It would thus seem that the remarks of Mr. Jones, alluded to in Mr. Prosser's article, are fully

* Some, not acquainted with the history of my condensers, may think that I have been peculiarly unfortunate in having so many vessels with defective tubes. These constitute, however, but a fraction of the ships into which they have been introduced, embracing many of the largest and finest ever built.

borne out by the facts cited, as well as that it is important, in an economical point of view, to select the purest kind of copper for the tubes. Additional verification would also appear to be afforded by the result ascertained at the salt works at Salina, New York, where the pans made of this Lake Superior copper have proved very inferior in durability to those of pure Spanish copper.

As these questions are of interest not only to the engineer, but to all connected with ocean steam navigation, I will add that I have also tried brass for the tubes, both tinned and untinned. In the steamship *St. Louis*, as an experiment, one-half of the tubes were of Spanish copper and one-half of brass, both without being tinned. In the Collins steamship *Adriatic*, the tubes were of brass, tinned. Their durability in the latter vessel is of course yet to be determined. In the *St. Louis*, however, thus far, the wear appears to be equal; at least, none of the tubes have worn out, after a period of about four years.

5 Wall street, New York, September 9th, 1858.

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*On Lighting Railway Trains with Gas; with Description of Mr. T. J. Thompson's System.** By Mr. Kitson.

The lighting of railway trains has received comparatively little attention during the progress and improvements in the railway system, the oil lamp having undergone but few improvements, though its defects have been generally felt. Gas possesses important advantages over all the oil lamp arrangements yet produced, in the constant brilliancy of the light, requiring only two lights for each carriage—the saving that may be effected by turning off lights from all unoccupied carriages—the brilliant light thereby obtained for the tail and side lights of the train—and the saving in expense.

The first use of gas, to the writer's knowledge, for lighting railway trains, was in the United States, where an arrangement, which seemed to answer, was tried during 1856, upon the Galena and Chicago Railway. Under the floor of each car is placed a gas-holder, consisting of two tubes, each divided into two compartments by a longitudinal diaphragm of india-rubber. Gas is admitted to the tube on one side of the diaphragm from the gas main at the station, thereby pressing the diaphragm against the side of the tube; and the gas is then forced out to the burners by means of a dry metre or small pump, placed on the car, which pumps in air on the other side of the diaphragm, pressing it back against the opposite side of the tube, and thus forcing out the gas. This arrangement has many advantages for an American railway, where a railway car is so much longer than an English carriage, one car accommodating about 70 passengers; and the number of cars therefore required to form a train sufficient to carry 200 passengers amounting to only 3, whereas upon an English line it would require 11 carriages to accommodate the same number of passengers.

*From Newton's London Journal of Arts and Sciences, August, 1858.

The advantage of the American system of railways for adapting a gas-holder to each car independently is very great, each car being carried upon two trucks, which have their bearings close to the ends of the car, thereby leaving a large unoccupied space, 20 or 30 feet long, which is well adapted for a gas-holder sufficient to supply 6 lights for 12 hours.

The success of these experiments induced Mr. T. J. Thompson to produce an arrangement for the use of gas lights suitable for English railway trains. From the difference between the two systems of working, an arrangement that would answer upon an American railway would be inapplicable in this country: to have the gas-holder above described under every carriage, where a company may have 400 or 500 carriages, would involve an expenditure which could scarcely be repaid by any result; whilst the great difficulty of keeping such a stock of gas-holders in perfect repair, and the annoyance arising from the slightest defect, would prove a constant source of complaint from travelers.

To produce an arrangement suitable for an English railway, two requisites have to be obtained:—first, a gas-holder suitable to supply a train of carriages, and formed of a material not perishable; and secondly, a perfect form of coupling, with which the escape of gas, from neglect or carelessness in putting together a train of carriages, is impossible.

A gas-holder, forming a separate piece of rolling stock by itself, would not be practicable, excepting in cases of very long trains, since the expense of haulage would, to a great extent, counteract the advantage gained by adopting gas in place of oil; and it is therefore necessary that it should form part of the tender or luggage van, or be combined with some other portion of the existing rolling stock. A rectangular gas-holder, upon the ordinary stationary principle, 10 feet long, 7 feet wide, and 3 feet 6 inches deep, would require a mass of water weighing about 6¾ tons, a dead weight which would be inadmissible for running over a line; and the motion of such a quantity of water would render it difficult to get a gas-holder to work properly; while the balancing of the gas-holder by weights would also be a complicated arrangement.

These objections have been overcome by the use of a simple form of gas-holder, which can be adapted to the tender or the luggage van, or can be combined with any of the carriages.

A rectangular tank is constructed, having only an aperture 12 ins. diameter in the bottom, where a pipe for filling it with water enters, being brought up for that purpose at the back of the tender: the air escaping through a small pipe while the tank is being filled. The feed-valves are placed at the bottom of the tank; the rods which work them passing through stuffing-boxes, to prevent any leakage of water. Round the four sides of the tank is an outside sheeting, 1¼ ins. from the sides of the tank, formed of thin wrought iron plates, about No. 16 wire gauge thickness, which is fastened round the bottom of the tank to a wrought iron frame. This gives a space round the tank, 1¼ inches in

breadth (the depth of the tank), which forms the water space for the gas-holder to work in; the roof of the gas-holder, when empty, being 1 inch above the roof of the tank. The outside sheeting and the sides of the gas-holder are carried up 12 inches higher than the roof of the tank, so as to allow for variation in pressure of the gas. At the four corners of the tank are placed guide-rods, which are fastened into the bottom frame, and stayed at the top by light wrought iron stays, riveted to the top of the outside sheeting. These guide-rods are placed in the water space, and brass roller guides are fixed at the top and bottom of each corner of the gas-holder, which work upon the guide-rods. Round the bottom of the gas-holder T iron or angle iron is riveted, to prevent the springing of the plates under the pressure; and at distance of 4 or 5 feet small rollers are placed, so that, should the pressure be sufficient to spring the sides of the gas-holder, these rollers would come in contact with the outside plates, and prevent the gas-holder from catching in any way upon the plates or rivets. In the water spaces round the gas-holder and over the top of the tank strips of light angle iron are placed, to act as breakwaters, and prevent any oscillating motion being imparted to the water; and a strip of strong leather is fastened round the top of the outside sheeting, against which the sides of the gas-holder work, for the purpose of preventing any pieces of coke from getting into the water space. Through the centre of the water tank passes a gas-pipe, which extends 12 inches above the top of the tank, so as to prevent any water getting into it; and upon the gas-holder is a small dome, fitting over the pipe. This central pipe branches off below the tank to each side of the tender, where a coupling or union joint is fastened on the ends, for the purpose of coupling on to the pipe of the stationary gasometer. A small gas-pipe branches off from the central pipe to the coupling apparatus at the back of the tender, and so on for the supply of gas to the carriages.

A gas-holder, such as above described, 10 feet long, 7 feet wide, and 3 feet 6 inches deep, will contain 216 cubic feet of gas, allowing the bottom of the gas-holder to be 5 inches below the level of the water when full of gas, which is a necessary allowance for motion of the water or the difference of level of the two ends caused by steep gradients. The consumption of an average-sized burner being 3 cubic feet per hour, a train of 12 carriages, burning 2 lights each, gives 24 lights, consuming 3 cubic feet per hour each, or 72 cubic feet total,—making a consumption of 216 cubic feet in 3 hours; so that this gas-holder wil supply 12 carriages for 3 hours. The process of filling the gas-holder is simple:—At the principal stations along the line, at distances of from 50 to 100 miles, as circumstances may admit, there are small supply gasometers, from 8 to 12 feet diameter, which work at a pressure of from 12 to 24 inches of water: when a tender gas-holder requires filling, a branch of the central pipe is coupled by means of a union joint to the supply gasometer; and the pressure, being from 8 to 20 ins. greater in the gasometer than in the tender gas-holder, raises the latter, and fills it in from 1 to 2 minutes. As it was anticipated that the motion of the train would have the effect of giving the gas-holder a

jumping motion between its guides, owing to the elastic character of the gas, it was thought necessary to guard against this by inserting a rack in each guide-rod, and fixing a spring catch upon the top corners of the gas-holder, which, after catching the teeth of the rack, prevented the gas-holder from rising. However, in making the practical experiments with the gas-holder, this provision proved to be useless, the gas-holder working comparatively steadily, and having no tendency to rise more than $\frac{1}{8}$ inch. The result of this slight motion upon the flame was evident, in some instances drawing the gas back from the burner, and consequently extinguishing the light. These shocks, which are instantaneous, are now remedied by the simple arrangement of placing a small back flap-valve at the junction of the leading-off pipe with the gas-holder, which valve remains open so long as the gas enters the pipe from the gas-holder, but closes whenever the gas-holder has a tendency to draw the gas back from the pipe. The working of the valve has but a very slight effect upon the pressure in the pipes, the action being so rapid; and the effect upon the flame could not be detected when this plan was adopted. There is an advantage in adapting the gas-holder to the guard's van at the present time, even supposing the interior could not be made available for luggage, from the impracticability of altering the tenders made upon the present system, and from the guard's van, for a passenger train, not being in many instances of sufficient weight in itself as a break van, and requiring the addition of a considerable weight of iron to make an efficient break; in place of which dead weight the gas-holder will give all this advantage, the weight of a gas-holder, 10 feet long, being about $1\frac{1}{2}$ tons, including the water requisite for its working. Also, when running at the end of the train, the tail light, which is the most important, will be upon the same carriage as the gas-holder, and supplied by an independent pipe, which will preclude the possibility of its getting out of order.

The satisfactory working of the above arrangement of gas-holder has been practically ascertained by trial upon different lines, where it has been severely tested by being placed upon uneasy working tr[illegible]ks, which were found to have no effect upon its action.

A supply gasometer, of simple construction and small expense, was then required for charging the train gas-holders. For this purpose there was provided a small circular gasometer, 12 ft. diameter and 8 ft. high, containing about 900 cubic ft. of gas, sufficient to supply 2 or 3 train gas-holders without being filled from the gas works. It was balanced with weights running over pulleys in the ordinary manner. As the pressure requisite for filling the train gas-holders is from 12 to 24 inches of water, and the ordinary pressure at gas works only from 2 to 3 inches, the extra pressure in the gasometer was obtained by water on the roof. In order to fill the gasometer with gas, the water is all run off the roof by opening a cock, and the gasometer, being balanced by weights, rises with the gas works' pressure, the gas being admitted by a central pipe, through a self-acting gas-valve. As the gasometer rises, the lever of the water-discharge-cock, comes in contact with a projecting catch, which shuts the cock; and the gasometer rising to the top

of its guides, a projection on the gasometer comes in contact with a balance lever, which opens a water valve, and lets water on to the roof of the gasometer through a vertical pipe. When sufficient water has been let on the roof to give the required pressure, the gas is compressed by the gasometer falling a certain distance, and a second projection, depressing the balance lever, shuts the water valve; the gasometer is then ready to supply the train gas-holders with gas.

The self-acting gas-valve used, rises and falls with the slightest difference of pressure between the gas in the gasometer and that in the gas-works' pipe. The seating of the valve is formed of two circular ribs cast round the entrance orifice for the gas, and forming an annular cup to receive mercury $\frac{3}{4}$ inch in depth. The outer rib is carried up, to serve as a guide for the valve to work in. The valve is formed of thin sheet iron, and is balanced by a weight at the opposite end of the beam which carries it. When the pressure is equal above and below the valve, it merely touches the surface of the mercury; but when the water is let on to the top of the gasometer, the pressure in the gasometer sinks the valve, and causes the mercury to rise according to the pressure. This form of valve is self-acting in every respect, and must be perfectly tight, no leakage being possible; the only communication being through the mercury, when the valve is down.

The coupling between the carriages is effected by vulcanized india rubber tubing, with a cut-off apparatus fastened upon each end of every carriage. It consists of a short cut-off pipe, working upon a stopper, similar to an ordinary cock; the india rubber tube is attached to the pipe by a union joint. When the cut-off pipe is down against the side of the carriage, the hole in the pipe coincides with that in the stopper, leaving a clear passage for the gas: in this position, the cut-off pipe is held by a spring, which clasps it close above the union joint; and the joint is protected and closed in by two projecting wings. In uncoupling the carriages, before disengaging them, the porter pulls the india rubber tube, and thereby brings the cut-off pipe into a raised position, when the gas is cut off, and the pipe is held up by the spring catch, which prevents it from falling back, enabling the porter to unscrew the union joint. The india rubber tube is attached to the carriage by a chain, and, when disconnected, is hung upon a hook on the carriage: a tube is provided at each end of every carriage. In coupling together the carriages, after the carriage coupling has been screwed up, the india rubber tube is attached to the cut-off pipe, by the union joint, which requires three turns, and the pipe is then released from the spring-catch, and pushed down to position, thus turning on the gas to the carriage. The whole time taken up in either case should not exceed a quarter of a minute. In the event of one carriage becoming accidentally detached from the next, in consequence of breakage of the carriage coupling or otherwise, the strain thrown upon the india rubber tube will pull the cut-off pipe into the horizontal position, before the tube breaks, thereby cutting off the gas; and this coupling accordingly prevents any possibility of a carriage being detached from a train without cutting off the communication with the gas-holder.

The pipe supplying the burners in each carriage may run under the floor, or along the roof, as is most convenient. When a carriage is detached from the gas-holder, as in shunting at junctions, the lights in the carriage are prevented from going out by means of a small india rubber supply bag, about the size of an ordinary air-pillow, which is placed under one of the seats of the carriage, and connected to the gas-pipe supplying the burners. When the pressure of gas in the pipe is reduced to 1 inch of water, the supply bag begins to collapse, supplying the burners until the carriage is again attached to a train; the bag, containing about 1 cubic foot of gas, would be sufficient to keep the two burners in each carriage supplied for about half an hour.

The comparative cost of gas and oil for lighting railway trains remains now to be considered.

The actual cost of lighting a train of 12 carriages with oil lamps, while running 100 miles, amounts to about 9*s.* 6*d.*, or 1·14*d.* per train per mile. With carriages burning gas, having 2 lights each, each burner consuming 4 cubic ft. of gas per hour, assuming 4 hours as the time taken in running 100 miles, the amount consumed in running 100 miles would be 384 cubic feet; and allowing 5 cubic feet per hour for the tail lamp, and 4 cubic feet per hour for each of the two side lights (making 52 cubic feet in 4 hours), the total consumption would be 436 cubic feet for a train of 12 carriages running 100 miles. Taking the cost of gas at 4*s.* per thousand cubic feet, which is the average cost throughout England, the total cost will amount to 1*s.* 9*d.* in running 100 miles, or 0·21*d.* per train per mile, as compared with 1·14*d.* per train per mile, the cost of oil lamps.

If a train of 12 carriages, burning gas, runs 100 miles per day on an average throughout the year, the cost of gas at the end of the year would be £31 18*s.* 9*d.*, allowing 4 cubic feet of gas per hour to be consumed by each burner, which is 25 per cent. more than should be burned, thus allowing for loss and waste. For the same train burning oil, and running on an average 100 miles per day throughout the year as before, the sum would amount at the end of the year, to £173 7*s.* 6*d.*, showing a saving in expense during the year, for a train of 12 carriages, of £141 8*s.* 9*d.* If a railway company run 10 trains, of 12 carriages each, 100 miles per day, on an average throughout the year, the cost of lighting would amount to £1733 when burning oil, and to £319 when burning gas, showing a clear saving with gas, of £1414 in the year, after allowing 25 per cent. for leakage or waste. The power of turning off the gas from unoccupied carriages, and from trains standing at stations, previous to starting and after arriving, would, at a fair calculation, give 15 or 20 ℔ cent. of further saving to be added to the above.

The cost of 10 train gas-holders, at £30 each, would be £300; and assuming a railway company to have 300 miles of road, requiring a small supply gasometer for filling the train gas-holders at distances of about 60 miles, 6 gasometers would be necessary in this case, at £40 each, making £240 total; and taking the coupling apparatus, pipes, supply bags, and glass shades, at £3 for each carriage, for 120 carriages, the cost would be £360. The total cost, therefore, of fitting up

a railway 300 miles long, and having 120 carriages, reckoning 10 train gas-holders, and 6 supply gasometers, would be £900. This, taken from £1414, leaves to a railway company, after fitting up their line and carriages complete, a sum £514 clear, after paying all expenses for the year; and as the outlay for keeping the apparatus in repair would be small, the saving by the use of gas would afterwards amount to about £1400 per annum, in the case of 10 trains as above taken.

The comparative cost of lighting railway trains with gas, is much more as here taken than would be found in actual practice, since there are so many additional expenses connected with the oil lamp arrangement, as at present worked, which cannot be ascertained satisfactorily, to make the statement of the cost of oil complete.

Proceedings Inst. Mechanical Engineers, London.

AMERICAN PATENTS.

List of American Patents which issued from July 6 to July 27, 1858, (inclusive,) with Exemplifications.

JULY 6.

1. Machine for Cutting Corks; Robert P. Abernethey, Assigned to Union Cork Manufacturing Co., Cincinnati, Ohio.

Claim—1st, In this connexion, the automatic feed rest. 2d, Imparting to the mandrels of a cork cutting machine a compound rotary and vibratory movement, by means as set forth.

2. Machine for Cutting Corks; Robert P Abernethey and Mahlon M. Wombaugh, Cincinnati, Ohio.

Claim—1st, The rotary cutter head, having alternate blades and spaces, in combination with the automatic mandrels, to admit of the removal of the finished cork, and clamping the fresh blank without removing either cutter or mandrels. 2d, In combination with the intermittent cutting disk and mandrels, the arrangement of half wheel cam movement and the accessories 3d, In this connexion the feed apparatus, consisting of the hopper, notched piston, and cam movement, with their accessories. 4th, In the described connexion with the feed piston and mandrels, the spring pressure plate or finger, operated substantially as set forth. 5th, In the combination with the feed piston and mandrels, the discharging spring or strip.

3. Machines for Raking and Loading Hay; John B. Benton, J. F. Behn, and Gottlob Bastian, Buffalo, N.Y.

Claim—The combination of the bands, plate, and forks, the whole being constructed for operation conjointly, as set forth.

4. Sewing Machines; Robert M. Berry, City of New York.

Claim—Lifting the feed slide from the cloth, as described, by the double trip lever, the trip slide, and the trip spur, or their equivalents.

5. Machines for Gathering Stones; G. W. Bishup, Brooklyn, New York.

Claim—The box provided with the inclined plane, and used in connexion with the reciprocating scraper and spring guides, or their equivalents.

6. Sewing Machines; Lyman R. Blake, South Abington, Massachusetts.

Claim—The arrangement of the rest of a sewing mechanism, or combining it with an auxiliary arm of such form as to be capable of entering a shoe and introducing the rest into the toe, as well as other parts of the interior of the shoe, in order that an outer sole may be stitched or sewed upon the inner sole and upper of a shoe. Also, arranging either the thread passage or looper, or both, within, or so as to operate with the auxiliary arm.

7. Breech-loading Fire Arm; Enoch Brooks and George Walker, Philadelphia, Pennsylvania.

Claim—1st, The attachment of the hammer to an arm having a curved back, to which the main spring is applied. 2d, The arrangement of the cocking lever, the sere, and trigger, as applied in combination with the main spring and hammer arm. 3d, Combining the cocking lever with the breech, by means of a slider, rod, and wrist pin, applied as described, to cock the lock by the movement given to the breech to permit the loading.

8. Railroad Car Seats and Berths; Zenas Cobb, Chicago, Illinois.

Claim—1st, Arranging the lower portion and hinged backs of the seats on the rail and ledges, so as to either enable them to be used as a double sleeping couch, or as a seat, in the manner described. 2d, The arrangement of the cushioned frames or platforms above the seats, and jointing them to the uprights of the partitions and sides of the car, and providing them with lugs, and the sides of the car and the movable bar with swinging hooks or lugs for forming the upper double berth when desired.

9. Stopper for Bottles; Munson C. Cronk, Auburn, New York.

Claim—Attaching to the necks of bottles and within a tapering space, a tapering or flaring tube, having

a concentric cylindrical tube cast or secured around the same with a cap screwed on its top, and an outlet tube attached to its sides.

10. Method of Attaching Lamps to Lanterns; John Fleming, Pittsburgh, Pennsylvania.

Claim—The combination of the spring, D, with the clips, E E, and the ring, F, for the purpose of effecting the attachment and detachment at the lamp of a lantern.

11. Boring Machine; L. A. Dole, Salem, Ohio.

Claim—1st, The combination of two drill stocks, by means of an internally geared driving wheel and a small pinion, so that a slow or fast speed drill or auger may be used at pleasure, as the necessity of the case may require, in the same machine, and by the turning of one and the same crank. 2d, Effecting the combination of both of said drill stocks, with the feeding rack bar and the two segment levers, by means of a flanch on the rear end of the rack bar, and collars on the drill stocks, so that both shall be fed up together.

12. Machine for Upsetting Carriage Axles; Zina Doolittle, Perry, Georgia.

Claim—1st, The arrangement of the centre bar or anvil, pivoted jaws, and eccentric levers, in the relation to one another shown. 2d, The combination with the above of eccentric clutches, dies, springs, and slides.

13. Corn Planters; Warren Drummond, Woodbridge, New Jersey.

Claim—The particular manner described of arranging and combining for united use only the two dropping slides, double-acting cut-off plate, double crank axle, covering rollers, combined brace and scraper, adjustable furrow-opening and closing tubes or shares, and secondary hopper.

14. Steam Engines; John Ericsson, City of New York.

Claim—The arrangement of the two cylinders in such manner that their base or bottom ranges with a plane which passes through the axis of the propeller shaft, or nearly so, in combination with a system of rock shafts, crank levers, and connecting rods, so proportioned, applied, and arranged that the use of a driving crank on the propeller shaft, of greater length than half the stroke of the piston, is permitted, and that the connecting rods will operate nearly at right angles to each other, and will be in a line with each other at the termination of each stroke of either piston.

15. Pump; Gilbert B. Farnum, Meriden, Connecticut.

Claim—The use of the thimble, cap, and guide rod, having a re-acting spring attached to its upper end, and confined within the air-tight thimble, in combination with the valve and elastic diaphragm, for the purpose of lifting and dropping said valve squarely from and to its seat, and at the same time protecting the guide rod and re-acting spring attached thereto, from the rust of the liquids acted upon by the pump.

16. Mills for Cutting, Crushing, and Expressing the Juice from Sugar Cane; John J. Fearrington, Pittsborough, North Carolina.

Claim—In combination with the cutter and the dressing rollers, the guiding trunk and dividing board, the whole being arranged for cutting, conducting to the pressers, and pressing and separating the spent cane from the juices.

17. Registering Attachment for Clocks; Stanislas Fournier, New Orleans, Louisiana.

Claim—1st, In combination with the clock, the wheel, C, by which I give motion to the wheel, D, that moves the rack, F, for a portion of the twenty-four hours; this I claim when either using the wheel, D, and the rack, F, as set forth, or any other analogous mode by which the apparatus can be made to register substantially the same, as regards the time specified. 2d, The carriage, K, in combination with the rack, F, when the action of the clock, through the use of the rack, or its equivalent, gives motion to the carriage, and holds the index bar, M, over the card, ready to have the time indicated.

18. Pumps; A. A. Genung, Painesville, Ohio.

Claim—Forming the plunger rod in two separate and distinct parts, and constructing said parts with the barbs and raised surface, also the form and location of the guides, as specified, or their equivalents, by which said arrangement of parts, in combination with the motion of the wind wheel, I am enabled to apply the connecting and disconnecting principle to the plunger.

19. Faucets; Henry Getty, Brooklyn, New York.

Claim—1st, The cylinders and slots, in combination with the arm on the valve stem, and the inclines, for the purposes specified. 2d, The suction pipe between the point of leakage or overflow at the spindle rod or valve stem and the delivery pipe, when said pipe is in such a position to the discharging liquid that the rush of said liquid past its end shall augment the speed of the liquid in said pipe, and draw away any leakage, as specified. 3d, The air tube of thin sheet metal, or equivalent material, inserted into the shell of the faucet. And in combination with said tube, I claim the self-acting air valve on the cock.

20. Machine for Turning the Heads and for Nicking Screws; Ira Griggs, Assignor to the Utica Screw Manufacturing Co., Utica, New York.

Claim—1st, The arrangement of a series of rotating blank holders in bearings, at equal distances apart, in and at equal distances from the centre of a stock, which has an intermittent rotary motion, for the purpose of presenting each of the series in succession to the feed apparatus, to the cutter for turning the heads to the saw, for cutting the notches, and to a cutter for finishing the heads after the notches have been cut. 2d, The relative arrangement of the driving shaft, the blank holders and their rotating stock, the turning cutters and the saw for cutting the notches, whereby, when the blank holders severally arrive opposite the saw, the driving belt which gives them the rotary motion on their axis to effect the turning, is inoperative upon them. 3d, The series of movable rests, applied and operating substantially as described, to support the screw blanks, and hold them steady during the operation of the cutters and saw. 4th, Combining the holding dies with their operating levers, by making the said dies detached from their levers, and fitting them to slide within guides in the holder, and applying adjusting screws to the levers at their bearing upon the dies. 5th, Applying the discharging punches of the blank holders with springs to retract them within the holders after the discharge of the blanks, and in such manner that the plungers, after opening the holding dies or jaws, will drive them forward to expel the blanks.

21. Ploughs; I. P. Harris, Byhalia, Mississippi.

Claim—The hollow foot, formed and arranged for the reception of the stock, substantially as specified.

22. Washing Machine; R. H. Harrison, Laurel, Maryland.

Claim—The construction of a washing machine having a concave bottom, with a secondary grating-like or fluted bottom, the slotted rocking lever, and the corrugated balls, or their equivalents.

23. Machines for Testing the Strength of Springs; S. H. Hartman, Pittsburgh, Pennsylvania.

Claim—1st, The application of steam through mechanical appliances to the compressing springs, with a

view of testing their temper or strength. 2d, In combination with steam, applied as stated, for compressing the spring to ascertain its temper or strength, the application of a steam indicator for showing in pounds weight, or otherwise, the amount of pressure applied.

24. Chairs for Railways; Wm. Hall, Springfield, Massachusetts.

Claim—The mode described for securing the ends of rails.

25. Lathes for Turning in Metals; George Henderson and Jacob Steele, Allegheny, Pennsylvania.

Claim—The combination of the two chucks with a lathe.

26. Running Gear of Wagons; Jonathan Hibbs, Tullytown, Pennsylvania.

Claim—The method described of operating both the axles of a wagon in turning curves, namely, by means of the curved rack affixed to each axle, in combination with the connecting pinion.

27. Rotary Pump; A. P. Holly, Seneca Falls, New York.

Claim—A rotary pump provided with eccentric cylinders, having concentric portions and corresponding depressions, and operating within the compartments of the case, substantially in the manner specified.

28. Method of Constructing Iron Railings; Luther Homes, New Orleans, Louisiana.

Claim—Securing and embracing the circular projections at the upper and lower ends of the upright bars, within the horizontal tubular rails formed by the semi-circular and straight bars, and the portions of said bars next the flat circular parts between the notches in the bridge plates and the left hand ends of the notches or depressions in the edges of the bar, and the right hand ends of the corresponding notches or depressions in the edges of the bars, by means of the interlocking pins, and pins or lugs, and hubs or blocks.

29. Cultivators; Duncan E Hubbard, Okolona, Mississippi.

Claim—The combination of share, stock, and tooth, the whole being arranged as set forth.

30. Measuring Faucet; Gilbert Hubbard, Montville, Massachusetts.

Claim—The combination of the passages, with the rotating cylinders provided with followers connected by the lever, and operated through the medium gearing, pawl, nichet, and spring, the above parts being used in connexion with the cut-off, arranged with the nut and levers, or other equivalent device, whereby the cut-off may be closed automatically and simultaneously with the cessation of the rotation of the cylinders.

31. Rotating Shafts without using a Crank; Simon Ingersoll, Greenwich, Connecticut.

Claim—The lever with its slide, or its equivalent, when arranged in the manner set forth.

32. Skirt Hoops; Austin Kelley, City of New York.

Claim—Combining and arranging two hoop skirts together in the manner set forth, the inner skirt being adjustable for the purpose of forming a bustle when contracted, and for an additional support to the outer skirt when expanded.

33. Steam Boilers; A. R. Ketcham, Buffalo, New York.

Claim—The construction and arrangement of the interior fire chamber relatively to the furnaces and the registers, for the purposes set forth.

34. Churns; James Macnish, Berlin, Wisconsin.

Claim—Effecting the breakage of the globules or sacks which contain the fatty particles of the milk or cream by the combined forces of compression and friction, employing for producing these forces a roller, in combination with a stationary concave, the roller revolving within and coming in contact with said concave.

35. Churns; James Macnish, Berlin, Wisconsin.

Claim—The combination of the inner set of tangentially set spring wings with the outer set of wings, as set forth. Also, the combination of the friction plates, H J, with the two sets of spring wings, and the churn tub.

36. Dust Pan; Thomas E. McNeill, Philadelphia, Pennsylvania.

Claim—Constructing the dust pan with a dust receptacle or box and an inclined surface.

37. Raking and Binding Attachment to Harvesters; John P. Manny, Rockford, Illinois.

Claim—In combination with a reaping machine, a rake that automatically throws itself out of gear when it arrives at the outer or grain end of the platform, in the manner described. Also, combining with a rake that automatically throws itself out of gear, and a gathering apparatus, a mechanism by which the driver from his seat, or the attendant at his stand on the machine, can throw said rake into action when desired. Also, in combination with a rake and the gathering apparatus to form the gavel, the bent arm, provided with the points for the purpose of holding one end of the band that is to fasten the gavel when gathered. Also, the bent lever with its forked head, which, when operated as above described, shall carry the band between its prongs, and which, when released, shall be driven back by the spring releasing the band, the hook of which shall then be driven into the band by the expansion of the gavel. Also, operating the lever by means of the coiled spring, for the purpose of adjusting the motion of said lever, so as to bind large and small bundles equally tight.

38. Harvesters; John P. Manny, Rockford, Illinois.

Claim—In combination with a main frame supported in a fixed position, that is, parallel with the surface of the ground at all times, and a finger bar attached thereto, and operated as described, one arm of the said frame extended sufficiently to the rear to project over or behind the finger bar of the machine; and this I claim, whether the caster wheel be in front of, or behind, the driving wheel.

39. Track Clearers for Harvesters; John P. Manny, Rockford, Illinois.

Claim—A wing board or track clearer, which is hinged to the divider and composed of two or more parts which are hinged together, and which may be adjusted together or independently of each other.

40. Harvester Fingers; John P. Manny, Rockford, Illinois.

Claim—Tapering the face of the guard finger under the sickle bar, and to the rear thereof to a point, and forming a cavity under and behind said point.

41. Mode of Securing Grain in Bundles or Sheaves; John P. Manny, Rockford, Illinois.

Cilam—The use of a short band cut in suitable lengths for separate bundles, placed in proper position by hand, and automatically passed around the bundle and fastened by the expansion of the bundle when released.

42. Burglars' Alarm Clock; John Matheuman, New Haven, Connecticut.

Claim—1st, The application to the lamp, of the revolving emery paper cylinder, operated as described.

2d, The combination of the frame having duplicated brackets, with the tube, match holder, and lamp. 3d, Connecting the lighting apparatus with an alarm clock, so as to operate either by the opening of the door or window of the room, or by the clock. 4th, The combination of the detaching lever, C, with the lever, B, and tongue, E, and their connecting wires, so that the lighting apparatus, and, if desired, the alarms, can be operated from a distant point.

43. Hillside Ploughs; Modest Merk, Rochester, New York.

Claim—The reversible convex winged colter share, constructed in combination with the plane subsidiary mould-board, connecting arm, and furrow bar

44. Harvesters; Jeremiah Mitchell, Gosport, New York.

Claim—Combining with the cotter bar of a harvesting machine, in the manner described, the tilting jack, constructed as described, that is to say, having the revolving handle, spring chuck, stationary catch plate, pinion, and rack bar, in combination with the wheel, C, these several parts being constructed and relatively arranged with respect to each other, and to the cutter bar.

45. Machine for Paring, Slicing, and Coring Apples; J. J. Parker, Marietta, Ohio.

Claim—The combination of the stationary screw, slicing and paring knives, by which the apples are fed and revolved. Also, feeding the apples past the paring knife to the sliding device, by giving the apples a rotating motion, and using a stationary screw, the screw slicing device and paring knife being arranged relatively with each other, as specified.

46. Sausage Filler; John G. Perry, South Kingston, Rhode Island.

Claim—The combination of the tube or nozzle with the curved cylinder, for the purposes set forth.

47. Machine for Stuffing Horse Collars; Levi Plonk, Newton, North Carolina.

Claim—The straw conveyers, in combination with the loose sliding frame, for the purpose of carrying the straw to the feed rod. Also, the elastic blades in combination with the guards, for the purpose of guiding the straw to the funnel.

48. Railroad Car Couplings; J. H. Quackenbush, Owasso, Michigan.

I am aware that various forms of self-couplings have been devised, and I do not claim separately any of the parts, irrespective of their construction, arrangement, and relative position, as described, whereby the device is not only rendered self-coupling, but is also rendered susceptible of being detached from within the cars, and the cars also if thrown from the track made to disconnect themselves. I claim therefore as new,

Claim—The lever, formed of two bars fitted in the head or socket, provided with a pendent connected with the pin or bolt, and having the chains attached to it, the whole being combined and arranged as set forth.

49. Ventilating Mill Stones; L. Racine, Joliet, Illinois.

Claim—The arrangement and combination of the blast pipe, curb, flanch, rim, flexible bottom, tube, and exhaust pipe, as set forth.

50. Machine for Leathering Tacks; Jesse Reed, Marshfield, Massachusetts.

Claim—1st, Driving the tacks and cutting out the piece of leather by a solid punch, operating as set forth. 2d, The nippers, in combination with the rest and tube, operating as described.

51. Attaching Carriage Springs; Luther Otway Rice, Berlin, Canada West.

Claim—Placing the scroll spring divergent to the axle, and supporting the same on the axle by means of the clip at the end thereof, and the raised double clip, or equivalent, near the wheel.

52. Machine for Leathering Tacks; Charles L. Russell, Derby, Connecticut.

Claim—1st, One or more separators leaving a cavity in their ends, or an equivalent therefor, which shall grasp the head or body of the tack, or both. 2d, The fingers, arranged in the relation shown to the tube or guide, and working alternately, so that one serves as a stop to the tack and the other as a discharger thereof, in such a manner as to ensure the dropping of the tack into the tube or guide with unerring certainty at the precise time and place necessary. 3d, The fork, or its equivalent, when working through or across a tube near its top, as shown, for the purpose of ensuring the dropping of the tacks perpendicularly into the tube. 4th, The guide or conducting tube, having inclined or horizontal passages running into each other, in combination with the driving punch, cutting punch, die, race, and feed motion. 5th, The self-adjusting grooved rest or guide, for receiving and supporting the point of the tack, when arranged so that the tack shall be kept on the guide by its own weight. 6th, Feeding leather or other material to the machine in the operation of leathering tacks by each succeeding tack itself, which is driven into or through the material used for forming the heads or disks, and acts as a stop to a feed motion, whereby to effect the movement of the material to a position in front of the cutting punch.

53. Sash Holder; Eliphalet S. Scripture, New Haven, Connecticut.

Claim—The oscillating swivel cup, in combination with an elastic buffer, all being arranged as set forth.

54. Cotton Cultivators; Asberry Smith, Ashville, Alabama.

Claim—The arrangement of the upright, brace, beam, and support, so that a plane will pass through or near the whole of them, and when the wing is connected to, and projects from, the said upright.

55. Arrangement for Devices for Planing Mouldings; Hezekiah B Smith, Lowell, Massachusetts.

Claim—The relative arrangement and combination of the spire feed wheel with the cutter head and table, they being adjustable with each other in the manner described.

56. Breech-loading Fire Arm; George H. Soule, Jersey City, New Jersey.

Claim—The peculiar construction and mode of operating the plunger, and securing it to its place while the gun is being discharged. Also, the brace and the connexion of the breech piece and the lever. Also, the cams as applied to raising the brace.

57. Tailors' Measure; W. R. Stace, Rochester, New York.

Claim—The construction and use of an instrument for measuring and drafting garments, said instrument consisting of the graduated arcs or dial plates (A' and B'), connected by the graduated arc (C'), said arc being expansible by means of slots, pins, and screws.

58. Treatment of Fibre of Tampico Hemp; Werner Staufen, London, England.

Claim—Changing the properties of the fibres of the plant known as the "Argrave Americana," by first saturating said fibres with an alkaline solution, and then immediately submitting the same to the action of a high degree of artificial heat, substantially as herein described, and preparatory to using said fibres as a substitute for horse hair and bristles in the production of various useful articles.

59. Continuous Chair Rails; Cornelius A. Stancliff and James Mingis, Williamsport, Pennsylvania.

Claim—The combination and arrangement of the part, A A′, with the protected cushion and with the continuous chair, which latter is adapted to form two lines of continuous rigid supports, one under each side of the body or tread of the rail, whenever the elastic material is compressed to a certain extent.

60. Nail Machine; Hiram W. Taylor, Birmingham, Pennsylvania.

Claim—1st, The use of a rocking journal box for the sleeve of the feeding rod, to permit of the elevation of the lower end of the feeding rod when the nail plate is turned, or when a full nail plate is to be inserted. 2d, The combination of the pivoted lever with the lugs, c′, on the cog-wheel, and the inclined projection on the segmental cog-wheel, for the purpose of securing their gearing together in the correct relative situation. 3d, The use of a crab for connecting shafts, having one lug nearer the centre than the other, so that the inner lug of one-half of the crab will pass the outer lug on the other half without locking, for the purpose of causing them to gear always at the same relative point in their revolution. 4th, The use of a button or stop at the head of the feed rod, in combination with a lever, through the extremity of which the feed rod slides freely until the button or stop touches or presses forward the lever, for the purpose of disconnecting the feed apparatus from the nail machine automatically so soon as the nail plate is worked up. 5th, The use of the gripping jaws, constructed as described, in combination with the rest, K′, and the spring, S 3, for the purpose of producing the requisite feed motion of the feed rod.

61. Rice Hulling Machines; John F. Taylor, Charleston, South Caroiina.

Claim—The employment of the curved lever frame attached at one end to the bed piece, and having the pestle permanently secured to the opposite end, the above parts being placed relatively with the vessel, B, described and used in connexion with the geared eccentrics, arranged relatively with each other and the lever frame, as set forth.

62. Corn Shellers; P. P. Taft, Taftsville, Vermont.

Claim—The rotating toothed cylinder, in combination with two or more reciprocating toothed concaves moving simultaneously in opposite directions, the parts being arranged within a suitable box, case, or framing, and operated as set forth.

63. Trunk Protector; R. M. Wade, Wadesville, Virginia.

Claim—The skeleton trunk casing made up of wooden strips with bent extremities, connected with straps and attached to the trunk.

64. Machines for Hulling Rice; R. P. Walker, City of New York.

Claim—1st, A surface of emery, in combination with an india rubber or other elastic surface for hulling rice or other grain, when motion is communicated to one or both of said surfaces, in such a manner that the surface of emery abrades the hulls for removing the same, as the rice or other grain is partially imbedded or retained by the said elastic surface. 2d, Imparting an endwise motion to an elastic roller, or its equivalent, in combination with a revolving roughened surface, when the same is used for the purpose of hulling rice or other grains.

65. Ear, Cheek, and Chin Muff; W. P. Ware, Cincinnati, Ohio.

Claim—The arrangement of the ear, cheek, and chin pieces, constructed and joined together in the manner represented.

66. Steam Alarm and Safety Apparatus; S. W. Warren, Brooklyn, New York.

I do not claim the expanding tube nor any of the parts that have heretefore been used in boiler alarms.
Claim—The arrangement and combination, as shown and described, of the arched or curved spring, valve, and tube.

67. Furnaces; B. H. Washington, Hannibal, Missouri.

Claim—The air conductors placed below the grate bars, constructed as shown, and used in connexion with the cones or funnels, as set forth.

68. Machinery for Pressing Straw Bonnets and other articles of Varying Thickness; H. E West, Norton, Massachusetts

Claim—A mould either hot or cold to form the article pressed, in combination with a flexible presser operated by a fluid substance, either liquid or gaseous, so as to press the article or substance to be shaped or moulded into the mould, and give it the form or shape required. Also, the use of cold water or other cold liquid to operate the flexible presser, in combination with a hot mould, so that the cold flexible presser will condense the moisture evaporated or driven from the article pressed by the hot mould, and leave said article nearly or quite dry. Also, the process of shaping bonnets, hats, or other articles, by pressing them into, or on to, a mould, either hot or cold, by means of a flexible presser, operated by some liquid or gaseous substance.

69. Making Paper Bags; Francis Wolle, Bethlehem, Pennsylvania.

Claim—1st, The combination of the creaser, C, and lapper, F G, arranged in the manner set forth. 2d, The revolving lapper shaft, u, in combination with the creaser, V S, the feed roller and aprons, as described, the creaser being brought into operation on the bags during the intermission in the motion of the feed rollers.

70. Bedstead Fastenings; E. S. Wright, Buffalo, New York.

Claim—The combination of the coupling hook, wedge, and pin, arranged in the manner set forth.

71. Furnaces for Steam Boilers; Henry Yates, Brantford, Canada.

Claim—1st, The perforated metal cone, in combination with the tight furnace bottom, operating in the manner set forth. 2d, And in combination with the above, the damper, operating as set forth. 3d, the water heater, in combination with the perforated metallic cone and damper, arranged in the manner specified.

72. Railroad Bridge Signalizer; Amos Burnham, Assignor to self and J. M. Cook, Taunton, Massachusetts.

Claim—A series of pendants and an arrangement of such as described, each pendant being of such weight as not to be capable of being so affected by ordinary ærial currents produced by a railway train, or otherwise, as to be readily blown out of the way of a person on the top of a car or train or the load thereof, while such may be passing under it, but still of a weight not capable of doing or causing material injury to such person under such circumstances, and each pendant being arranged at such distance from that or those next to it as to ensure contact with some one or more of them by a person when on the roof or load of a car, and being carried under them, and situated at such an elevation as not to be in danger of injury from a bridge or obstacle toward which the train or car may be advancing.

73. Stopper for Bottles; James Ewing, Assignor to F. V. Rushton, City of New York.

Claim—As an improvement in bottle stoppers for bottles containing gaseous liquids confined under high pressure, is the arrangement of the tubular stem valve, B, within the chest, A, with the cork tube, E.

74. WATER METRE; Wm. Darker, Jr., Assignor to J. B. Thompson, Philadelphia, Pennsylvania.

Claim—The combination and arrangement of the eccentric cams, G G′, angular rods, H H′, attached to the valve, K, and curved springs, E E′, and friction rollers, F F′, on the sides of the piston, A, for giving the required reciprocating movement to the valve.

75. HORSE HAY RAKES; John F. Faust, Lebanon, Ohio, Assignor to self and R. M. Ross, Philadelphia, Penna.

Claim—The combined arrangement of the arms, A′ A′, rods, B B, arms, E E, K K, and guide rod, A A, as constructed and arranged with the rake, H, and carriage, for operating the rake in the manner set forth.

76. VALVE REGULATORS; William S. Gale, Assignor to self, Alfred A. Valentine, and W. H. Butler, City of New York.

Claim—In combination with the plane diaphragm, corresponding load piece, compound lever, and the support, the projections or ridges on the under surface of the load piece, and the printing of the shape of the same into the diaphragm, for the purpose of preventing the slipping of C, laterally upon B, as set forth.

77. PUNCH FOR PERFORATING METAL; Washington J. Granger, Assignor to D. J. Lake and C. B. Brown, Chicago, Illinois.

Claim—The arrangement of a punch with a series of slides accurately fitting both punch and tube, and retained in their places by springs, or their equivalents, for affording a lateral support to enable the punch to withstand strain while operating.

78. PRESSURE GAUGE; Wm. C. Grimes, Assignor to David Matthew, Philadelphia, Pennsylvania.

Claim—The manner of constructing and arranging the concentric glasses and connecting tubes, as set forth.

79. PRESSURE GAUGE; Wm. C. Grimes, Assignor to David Matthew, Philadelphia, Pennsylvania.

Claim—The peculiar construction of mercurial pressure gauge, having two concentric glass tubes, so proportioned to each other and the reading scale as to produce the necessary space to register the units and tens, and make them more uniform and legible.

80. CORN HUSKER; Leonard A Grover, Roxbury, Assignor to self and N. T. Spear, Boston, Massachusetts.

Claim—The rotating toothed cone, plates, B, or boards, D D, one being provided with teeth, in combination with the tilting bed or hopper, and the vibrating knife and stationary knife.

81. LOCK; John Philip Lipps, Newark, New Jersey, Assignor to George D. Baldwin, City of New York.

Claim—The independent bit, constructed as shown, and held anteriorly or above the bolt by the horizontal spring (and independent of the spiral springs), thereby securing against the introduction of any instrument to pick the lock.

82. MAGNETIC STEAM GAUGE; Joshua Lowe, City of New York, Assignor to self and Daniel Barnum, Jersey City, New Jersey.

Claim—The construction of a polar magnet with one arm or pole larger than the other, so that the enlarged pole will float on the surface of the mercury, whether the lesser pole be immersed or not, whenever the said magnet is placed within a chamber filled or partially filled with mercury, and hung on pivots in the centre, thus making a self-adjusting movable magnet, capable of being used as a floating magnet within a small tight chamber. Also, the combination of a floating magnet, a magnetic needle, and a dial or index plate, forming one side of an isolated tight chamber, and with mercury and air within said chamber, or their equivalents, for the purpose of making a magnetic pressure gauge. Also, the combination of a floating magnet, a magnetic needle, and a dial or index plate, forming one side of an isolated tight chamber, and with mercury or other fluid within said chamber, for the purpose of making a magnetic vacuum gauge.

83. BURGLARS' ALARM CLOCK; George D. Sargent, Boston, Assignor to self and Thomas R. Abbott, Malden, Massachusetts.

Claim—The combination of the lamp and its lighting apparatus with an alarm apparatus, its case and the door thereof, so as to be operated thereby, or to operate in connexion therewith. Also, arranging the lamp and the match carrier on the door of the case, in combination with applying the match grater to the stationary part or body of the case. Also, the combination for operating the extinguisher, the same consisting in the match grater, the spring lifter, the depresser, the catch, and the detacher.

84. FAUCET; N. P. Whittelsey, Assignor to James A. Frary, Meriden, Connecticut.

Claim—The adjustable gate, constructed in the form of a segment of a sphere, and fitted to the tube over a concave seat provided with a packing.

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85. KNITTING MACHINES; Nelson P. Aiken, Troy, New York.

Claim—The arrangement of the shipper or belt-shifter, in combination with the movable stop, lever, and sliding bar, when controlled by a sinker wheel, or by any wheel gearing with, and moved by, the needles.

86. SPOKE-SHAVE; Leonard Bailey, Winchester, Massachusetts.

Claim—The improved spoke-shave, as constructed, with its bearing surface in front of its cutter, applied to the stock by means of a lever having an adjusting screw, or its equivalent, or a screw and a spring applied to it, so as to enable the said bearing surface to be moved with respect to the cutter and the bearing surface in the rear thereof. Also, the arrangement and application of a protecting cavity or chamber within the lever, and to the spring thereof.

87. KETTLES FOR RENDERING LARD; John J. Bate, Brooklyn, New York.

Claim—Providing a means of communication between the exterior and interior of the heater by the apertures, D D′, so that the contents of the kettle and the heater can communicate with each other.

88. SPRING PULLEY FOR WINDOW SASHES; Dana Bickford, Westerly, Rhode Island.

Claim—The combination of the friction wheel, or its equivalent, and the bearings of the pulley with the lip in connexion with other parts of the spring balance.

89. MACHINES FOR CUTTING PAPER; Milton B. Bigelow, Boston, Massachusetts.

I do not confine myself to the precise mechanical devices described, as they are susceptible of various modifications. It is very obvious, for instance, that V-shaped rails might be employed for sustaining and directing the sliding carriage and cutting-board in their movements; also, that a short shaft with a crank and

pinion on it, might be attached to the frame, said pinion being made to engage in a gear wheel affixed to the rock shaft, O, for the purpose of moving the cutting-board and paper.

Claim—The described mechanism, or any other essentially the same, by means of which the cutting-board is prevented from moving in any other direction than a straight line, in its horizontal motions, said mechanism consisting of the guide rails and the sliding carriage. Also, actuating the sliding carriage and with it the cutting-board, by means of the mechanism described, or any other essentially the same, said mechanism consisting of the levers, the rock shaft, and the straight lever, connected and operating in the manner specified.

90. Door Plates; Jeremy W. Bliss, Hartford, Connecticut.

Claim—The perforated door plate bell arrangement, constructed and arranged to secure the three-fold object.

91. Machines for Hulling Rice; Joseph S. Bossard, Sumterville, South Carolina.

Claim—The employment or use of the arms attached radially to the rotating shafts in connexion with the projections on the pestle shafts.

92. Machines for Dressing Hides and Leather; John R. Bumgarner and Lyman White, Davenport, Iowa.

Claim—1st, The combination, by means of two carriages moving at right angles to each other, one having an intermittent longitudinal motion, and serving to feed the hides or skins to the action of the dressing frames, and the other having a transverse reciprocating motion, and serving to carry and move the dressing frames across the hides or skins. 2d, The peculiar manner of constructing the intermittent carriage in sections, and with long and short clamps, whereby hides or skins of different sizes can be clamped and distended on the same. 3d, The automatic device, specified, for clearing the knives just after the completion of their movement from one edge of the hide or skin to the other, of all matter which may have accumulated on them, and which would be likely to clog their action. 4th, The arrangement of the standards, set-screws, levers, cords, and windlass shaft. 5th, The combination of the windlass shaft with the dressing frame carriage, by means of the ratchet movement and the projection.

93. Propeller for Canal Boats; Abner Burbank, Buffalo, New York.

Claim—A propeller and shaft movable in a longitudinal direction, in combination with a rudder having a notch or recess therein, to receive the propeller.

94. Rocking Chair; Isaac P. Carrier, South Glasenbury, Connecticut.

Claim—The arrangement of the frame or arms, rod, springs, stud, and the pin and holes.

95. Machine for Cutting Barrel Heads; A. H. Crozier, Oswego, New York.

Claim—1st, The disk, M, constructed as described. 2d, The method described of connecting the saw and cutter, so that both are controlled by the same winch or lever. 3d, Attaching the saw to a sliding stock.

96. Bustles and Skirts; Handel N. Daggett, Attleboro', Massachusetts.

Claim—The improvement or combination of the back strut with the bustle or skirt and the adjusting lacing, such being applied and made to operate as specified.

97. Tool for Cutting Cylindrical or Tapering Sticks; George Davis, Duquesne, Pennsylvania.

Claim—The combination of the cylindrical stock, adjustable block, and bit, constructed for cutting round or tapered sticks for handles, &c.

98. Force Pumps for Fire Engines; John N. Dennisson, Newark, New Jersey.

Claim—Increasing the capacity of the pumps of fire engines near the end of the stroke, by the expedients described.

99. Clothes-Drying Apparatus; Olonzo R. Dinsmoor, Auburn, New Hampshire.

Claim—The combination of the endless clothes line, the sheltering shed or building, and the stretching apparatus. Also, combining one or more travelers with the endless clothes line applied to a building and a stretching apparatus.

100. Metallic Hub for Carriage Wheels; Nathaniel T. Edson, New Orleans, Louisiana.

Claim—1st, The cone, H, when made and applied in the manner specified. 2d, The oil chamber, in combination with one or more orifices, when formed on the outside of the box by means of a nut. 3d, The combination of the oil cup with the cone, for the purposes specified. 4th, The chamber, as described, in combination with the outer cup.

101. Sawing Machines; Henry Featherstone and Peter Engman, New Orleans, Louisiana.

Claim—1st, The lateral movement of the saw. 2d, The suspension guides with their cups and balls, as applied here, to guide the saw and its connexions with the saw shaft. 3d, The back-bone rack connecting the truck. 4th, The truck and dog with their movement, by means of the sector and rack.

102. Railroad Car Box Cases and Pedestals; Jacob C. Grisendorff, Cincinnati, Ohio.

Claim—The employment of the lugs formed on box case, when used in connexion with the notches (two or more), formed in the pedestal, for the purpose of readily detaching or removing the box from the axle, yet retaining the box case in a proper position in the jaws of the pedestal.

103. Washing Machine; B. F. Ghormley, New Frankford, Indiana.

Claim—The combination and arrangement of the fluted and grooved roller, B, and the cords and roller, C, with the hinged washboard, springs, and temper screws.

104. Traps for Animals; Samuel Gibson, Martic Township, Pennsylvania.

Claim—The chambered box, wire drop cage, and tilting bottom, when combined.

105. Printing Presses; George P. Gordon, City of New York.

Claim—1st, One or more sets of gripers or nippers, independent in themselves, which shall revolve upon their axes, and carry the sheet from its point of feeding to its place of deposit, whether operated in the precise manner described or in some equivalent way. 2d, The "stop," or its equivalent, for holding the said gripers, or their equivalent, in the desired position, for the purpose of insuring an exact and regular feeding, registering, and delivering of the sheet. 3d, One or more sets of gripers (which revolve upon their axes,) having a movable base, with fingers to close upon said base, and hold the sheet, whether constructed in this precise manner or in some equivalent way, to produce a like result. 4th, The combined action of said gripers and the vibrating springs, strips, or frisket, for the purpose of conveying the sheet to, and receiving and holding it in, the proper position for the reception of the impression, and insuring its proper delivery after it shall have been printed. 5th, The vibrating double cam for throwing off and on the impression. 6th, Two or more

distributing rollers, having a lateral motion upon a main distributor, which shall move independent of, and in opposite direction to, each other, and thus alternately cross and re-cross each other's distribution, for the purpose of giving an uniform inking. 7th, The relative arrangement of the feed table, the fly board, the platen, and the bed, in combination with the revolving gripers. 8th, The two distributions given to the inking rollers upon one cylinder for each impression (heretofore patented by me), in combination with the rotating reciprocating bed with its spring extension. 9th, The fly board with its adjustable ledge, in combination with the gripers, to insure the even piling of the sheet, whatever its size may be.

106. Fire Escape Ladder; Joseph H. Grimsley, New Lexington, Ohio.

Claim—The wheels turning on the axles at the ends of the wings or steps, for the purpose of providing a space between the ladder and wall for the feet and hands of the individual when descending, to enable and aid the ladder to reach the ground, said wheels being placed at the axle at the ends of the rungs, especially for this important purpose and object, viz: that with the wheels so placed it is of no consequence or difference which side of the ladder is uppermost when thrown out, making no difference which side of the same rests against the wall. Also, the straps, which, combined with a ladder of the necessary strength and weight, as small, enables a person of ordinary strength to rescue the aged, infirm, young, and those too timid to descend alone, by lowering them to the ground by the hand.

107. Shingle Machine; Erastus Hall and Joel F. Stewart, East Randolph, New York.

Claim—The rack pivoted to the carriage, in combination with the rod, plate, pinion, and lever, with weight attached, for the purpose of feeding the bolt to the saw and gigging back the same automatically. Also, setting the bolt of the saw, by means of the bar provided with the rack operated by the backward movement of the carriage through the medium of the wipers and boss or hub on shaft, provided with spiral ledges, and the spring catch.

108. Method of Coppering the Interior of Ships, to Protect them from Lightning; Roswell W. Haskins, Buffalo, New York.

Claim—Protecting vessels from lightning by means of metal linings, arranged as described.

109. Churns; James Hatfield, Falmouth, Indiana, and Henry M. Goldsmith, Burlington, Iowa.

Claim—1st, The manner and form of inserting the adjustable brake. 2d, The basin or reservoir lid, with glass slide attachment. 3d, The quarter circle wings or dashers at each end of the shaft, in the form and position described.

110. Tailors' Shears; Bachus Heinisch, Newark, New Jersey.

Claim—The oblique rectilinear slot in the elongated shank of the lower blade, in combination with the fulcrum and lever connecting the shanks.

111. Pump; George Hibsch, Buffalo, New York.

Claim—The two screw wheels in combination with the bands, when arranged in relation to the cylinder in the manner described.

112. Machine Pulleys; Caleb S. Hunt, Bridgewater, Massachusetts.

Claim—The construction and use of machine pulleys with the bearing or band surface made of cork, as described.

113. Shoemakers' Edge Planes; Freeman Killbrith, Pembroke, Massachusetts.

Claim—The attachment to the edge now in use, and known as Dunham's patent, of the movable guard with its screw, the guard being movable to and from the edge of knife, and sliding on the face of the shank; and also the attachment to the shank of the knife, with its screw working in a slot, and raised or lowered to any desired gauge for paring soles, and which knife can be wholly removed from the shank by unscrewing the screw, and so ground or sharpened, and be replaced by a new knife if necessary.

114. Adjustable Pile-driver; T. W. Loveless, Corning, New York.

Claim—The frames connected by pivots or joints, and retained in desired positions by the perforated segment plate and pin, in combination with the bolster and bars attached to the frame and secured in desired position by the racks, serrated plates, and bar or clamp.

115. Paper Stock from Reeds; Henry Lowe, Baltimore, Maryland.

Claim—The prepared reed fibre, or new article of manufacture above described, as a substitute for rags, ropes, and other fibrous materials, for the manufacture of paper, said reed fibre or paper stock being prepared as set forth.

116. Machines for Drilling and Splitting Stones; John H. Lyon, Baltimore, Maryland.

Claim—The hammer stock and hammers, in combination with the drills and removable slugs for drilling and splitting blocks of stone.

117. Carriage for Sawing Machines; A. C. Miller, Morgantown, Virginia.

Claim—Arranging the head blocks in long mortises in the side pieces, and connecting the outer ends of said head blocks by overlapping arms or levers, furnished with adjusting holes or an adjusting screw, so that any length of bolt within the capacity of the saw may be held and operated therein.

118. Reaping and Mowing Machines; C. Moul, Hanover, Pennsylvania.

Claim—The combination of the truck frame, caster wheel, and lever.

119. Escapement of Watches; Jacob Muma, Hanover, Pennsylvania.

Claim—The escapement, consisting of a single escape wheel and two geared balances, with cylinders or cylindrical segments engaging with the said escape wheel or opposite sides of its axis, when said escape wheel and balances, with their segments, are arranged in relation to each other, with their axes in the same plane, and the gear of the said single escape wheel, with the segments, serves the double purpose of escape and of giving impulse to the balances.

120. Boat Propeller; Mortimer Nelson, City of New York.

Claim—1st, The vertical buckets, when arranged so that they shall be capable of folding against the side of the propeller frame, whether turned on their axis to the right or left, in combination with a reversible stop, which will, after being adjusted, hold the buckets in a position for acting against the water during the time the engine piston is making a stroke to effect the propulsion of the boat, either backwards or forwards. 2d, The arrangement of the buckets on the inner side of one of the propeller frames, and on the outer side of the other, in combination with the supporting slides.

121. Hemp Brakes; George M. Newell, Lexington, Missouri.

Claim—1st, Giving the slats of the pivoted frame a curve which is concentric with the axis on which the

frame in which they hang reciprocates, and arranging said slots or swords so as to move in curved slots of stationary pillars as the frame reciprocates. 2d, The arrangement below the breaking swords or slats, of two sets of stationary beaters or whipping rods and two sets of reciprocating beaters or rods, the latter being attached to pivoted rocking arms provided with curved slats, so that they shall reciprocate in the path of a vertical circle, and operate in combination with the stationary rods.

122. Apparatus for Cleaning and Polishing Coffee; William Newell, Philadelphia, Pennsylvania.

Claim—In combination with the cylinder which contains and furnishes heat to the coffee, the open wire diaphragms or partitions for furnishing rubbing surface. Also, in combination with the open wire rubbing surfaces, the flanches and heating tubes.

123. Endless Chains for Threshing Machines; Job E. Owens, Clark Lane, and E. G. Dyer, Hamilton, Ohio.

Claim—A chain composed of two different kinds of malleable cast iron links, as represented, and when the alternate links of chains are the duplicates of each other throughout the series, and the two kinds of links united in the manner set forth.

124. Manufacturing Knit Gloves: James Peatfield, Ipswich, Massachusetts.

Claim—The manufacture of seamless knitted gloves by knitting the hand and the fingers and thumb separately, and uniting them in the manner described.

125. Governor for Steam Engines; C. T. Porter, City of New York.

Claim—1st, In combination with arms and balls, or their equivalents, revolving at a much higher velocity than would be natural to them, considered as a conical pendulum, the employment of a counterpoise, applied as described, and so proportioned in weight as to balance, or nearly so, the centrifugal force developed by the revolution of said arms and balls, or their equivalents. 2d, So applying the counterpoise to the governor that its effective load shall be lessened as the governor rises, or as the balls and arms thereof, or their equivalents, expand, for the purpose of rendering it constant, or as nearly so as desired, relatively to the power of the governor to sustain it. 3d, The employment of the counterpoise applied to the governor in any manner substantially as specified, as a means of fixing or adjusting the exact speed of the engine.

126. Refrigerator; Henry Rehahn, City of New York.

Claim—In combination with the ice-box and ventilator arranged near the top of the refrigerator box, the centrally located cold air tube for carrying the cold air from said ice-box down to, or near the bottom of, the refrigerator, and admitting it into the retrigerating chamber, and in between the inner and outer cases, thence it ascends and escapes through the register.

127. Medicated Vapor Apparatus; Alex. F. Rose, Brooklyn, New York.

Claim—1st, The construction of the mask with a marginal cushion, a single or double back as passages. 2d, The construction of masks for encircling the neck or other part with a band of wire cloth, or other sufficiently flexible but yet sufficiently stiff material, a marginal cushion, a passage box, and an enveloping cloth of water-proof.

128. Gas Generators; G. W. R. Seal, Winchester, Virginia.

Claim—The employment of a secondary movable diaphragm applied within the retort, so as to support a portion of the cellular packing, and to be capable of being raised and lowered with such portion of the packing.

[Note.—A retort divided into two chambers is employed, in one of which the substance to be converted into gas is made into vapor, and in the other the vapor is converted into permanent gas, by passing through a packing of cellular character, so that it comes in contact with a great amount of heating surface. The invention consists in the employment of this cellular packing of shavings or scraps of copper or its alloys, by whose superior conducting powers the vapors are more rapidly heated and decomposed than when pebbles or scraps of iron are employed to form cellular packing in the retorts. An extra diaphragm is also employed in the second chamber to support a portion of the packing, and it is movable to vary the depth of the packing to suit the various materials that may be employed to make the gas.]

129. Churn; N. H. Sherburne, Campton, Illinois.

Claim—The combination of heads, slides, blades, and opposite rotating shafts, constructed as set forth.

130. Grain Cleaning Machines; N. H. Sherburne, Campton, Illinois.

Claim—The concentric and opposite moving fans, in combination with the corrugated head of the upper screen.

131. Scroll-Sawing Machine; E. Sirret, Jr., Buffalo, New York.

Claim—1st, The bent levers or bell cranks, H I, attached to the cross-heads of the saw, and operated by the eccentrics, or their equivalents. 2d, Having the upper lever or bell crank, I, attached to an adjustable plate operated by a screw, or its equivalent, for the purpose of readily and properly straining the saw and allowing the same to be relaxed and removed with facility from the machine.

132. Rolling Railway Chairs; J. H. Snyder, Troy, New York.

Claim—Forming or turning the tip or lips of the chairs upon the collar or collars of a roller, by means of another roller.

133. Butter Cooler; James H. Stimpson, Baltimore, Maryland.

Claim—A butter cooler made with an ice receptacle suspended over the dish, in the manner set forth.

134. Attaching Sleigh Runners; Wm. W. St. John, Lima, New York.

Claim—The combination of the T-formed slide, cap, and joint, for attaching the hind runner of sleighs to the body, when said runner is drawn by a connexion to its forward end.

135. Cotton Gins; Joshua Tetlow, Taunton, Massachusetts.

Claim—The rollers, one or more, grooved longitudinally and parallel with their shafts, and grooved also in a zigzag manner in connexion with the adjustable stationary plates and vibrating plates.

136. Apparatus as Aids in Extracting Teeth; Charles C. Thomas, Natchez, Mississippi.

Claim—A dental instrument having the adjustments substantially as stated.

137. Earthenware Dishes; Alson and Tracy Vail, Berlin, Wisconsin.

Claim—A covered dish with an absorbent lining perforated and unperforated, as specified.

[Note.—This invention consists in making dishes porous on their inner surface, so that the moisture shall be absorbed from hot eatables, and the same kept in a dry and palatable condition. To accomplish this result

the dish is formed of some porous argillaceous substance and only glazed on its exterior, or if the dish is of china-ware it may be rendered capable of absorbing moisture by being lined with a porous perforated substance.

138. Refrigerators; Nathaniel Waterman, Boston, Massachusetts.

Claim—The arrangement of the air supply and discharge pipes with respect to the case and its refrigerating chamber, in which arrangement the supply pipe or pipes are disposed within the refrigerating chamber, while the discharge pipe or pipes are disposed outside of the same. Also, the combination of a series of grooves or an auxiliary space or spaces, and a discharge pipe, or their equivalents, with the metallic bottom or lining of the refrigerating chamber, and arranged under the same and within the case or the stopping or bottom part of such case. Also, the arrangement of a space within the cover of the refrigerator, and around the odor discharge pipe.

139. Automatic Mechanism for Operating the Surveyor's Graphodometer; J. M. Wampler, Baltimore, Maryland.

Claim—The combination with a moving strip of paper, or other proper material, arranged on any suitable vehicle of automatic mechanism for taking and recording distances and courses or distances and levels, or distances, courses, and levels.

140. Smoke Stack for Steam Vessels; Wm. Webster, Jefferson Co., Washington Territory.

Claim—1st, The arrangement of two or more pipes, &c., within an outer shell, as described. 2d, The application to a double shell smoke stack of the registers, &c.

141. Saw-Mill Block; Hiram Wells, Florence, Massachusetts.

Claim—Operating the dog bar of the block by means of the lever fitted in the underside of said bar, the ribbed plate connected with the bar by the obliquely slotted plate and pin.

142. Tripod-head for Surveyors; Wm. J. Young, Philadelphia, Pennsylvania.

Claim—Constructing the head of a surveyor's tripod in such a manner that the portion to which the instrument and plumb-line are attached may be adjustable in any direction horizontally to the portion to which the legs are jointed, when the usual leveling screws serve the purpose of binding the two portions of the head together after adjustment.

143. Leather Shaving Knife; J. B. Wentworth, Lynn, Massachusetts.

Claim—The leather shaving knife, consisting of a stock with a bevel only on one edge, extending beyond the centre from Y to Z, and provided with screws combined with a blade having slots.

144. Self-dumping Coal Bucket; John Wust, Philadelphia, Pennsylvania.

Claim—The employment of the handle attached by pivots below the centre of gravity of the bucket, in combination with the sliding rod and the spring bolt.

145. Floor Clamps; H. C. Wight, Worcester, Massachusetts.

Claim—The toggle formed of the levers connected with a screw which passes or works through a pivoted nut, in combination with the claw-plate and head or jaw, attached respectively to the levers, the whole being arranged and connected with the frame.

146. Boot Trees; A. J. Wisner, Homer, New York.

Claim—The combination of shaft, G, bevel wheels, screw, H, nut, I, screw, F, and yoke, with the thin shaft, E, and hinged sole.

147. Device for Securing Lightning Rods; Victor Schrage, Cincinnati, Ohio.

Claim—The spiral spring, as constructed and arranged to the insulator, in the manner described.

148. Radiators for Heating Buildings, &c., by Combustion of Gas or Alcohol; I. H., Assignor to Wm. Al Chester, Cincinnati, Ohio.

Claim—The radiator constructed with a central opening in its bottom to receive the flame and heated products of combustion from the burner, and with the surface of said bottom inclining downwards from said opening towards two openings at the ends, and with the wire gauze cylinders, or their equivalent, between the slides, by which means combined, provision is made for the condensation and free escape of the water of condensation, together with such carbonic acid as may be absorbed by it.

149. Manufacturing Chair Backs; S. E. Foster, Fitchburg, Massachusetts, Assignor to Walter Heywood Chair Company.

Claim—The rest, consisting of two jaws which are moved an equal amount on each side of a vertical plane passing through the centre of the cutters, as the thickness of the stuff varies.

150. Atmospheric Regulator for Stoves, Furnaces, &c.; B. Holly, Assignor to self and J. T. Edwards, Seneca Falls, New York.

Claim—The employment of a pendulum or balance having a movable axis connected with the valve or damper by the levers, or their equivalents, in such a manner that the gravitating force shall increase as the damper closes, and diminish as it opens, for the purpose of regulating the admission of air to the fuel. Also, the method of hanging the dampers by means of the convex pivot, bearing arm, and sliding pivot.

151. Spinning Frames; Amasa Houghton, Putnam, Connecticut, Assignor to self, E. D. and George Draper, Milford, Massachusetts.

Claim—The application of the cap to the upright spindle and the bolster, so as to operate therewith.

152. Water-wheels; D. K. Krautz, Ephrata, Assignor to self and I. S. Roland, Bareville, Pennsylvania.

Claim—The perforated flanch which closes the spaces between the upper ends of the series of buckets, when the perforations in the said flanch are made to open into a close air chamber

153. Hand Stamps; Wm. Morse and John Hughes, Boston, Assignors to G. H. and A. F. Devereux, and O. W and E. E. Barrett, Salem, Massachusetts.

Claim—Combining with the stamping mechanism, a cast off mechanism for discharging the letter or article to be stamped from the bed or the cast off over the same. Also, combining the pad or cushion with, or arranging it directly upon, the cast off or plate thereof. Also, the combination for operating the cast off, the same consisting of the arm, the tripper, the arm, the shaft, and the spring.

154. Machines for Cleaning Grain; Wm. H. Orr, Assignor to Wm. M. Griffiths, Martin's Ferry, Ohio.

Claim—The application of the auxiliary shaft, constructed in the manner set forth.

155. Cooling Car Wheels; Robert Poole, Assignor to self and G. H. Hunt, Baltimore, Maryland.

Claim—The process of regularly cooling car wheels, whereby all strain within the wheel is avoided, the chill uninjured, and the web of the wheel is without curve or corrugation.

156. Machinery for Polishing Thread; Britton Richardson, Assignor to self and the Hayden Manufacturing Co., Haydensville, Massachusetts.

Claim—The construction of the dressing and polishing rollers, with ribs covered with flannel, felt, or material of similar character, and arranged relatively to each other.

157. Furnaces for Manufacturing Zinc Oxide; Joseph Wharton, Philadelphia, and Nathan Bartlett, Bethlehem, Pennsylvania, Assignors to Joseph Wharton, aforesaid.

Claim—1st, The construction and arrangement of the furnaces of double the usual length, without any separating end wall, and with a charging door to each extremity. 2d, The construction and combined arrangement of the conduit, the damper or valves, and the chimneys, in the manner set forth. 3d, The series of tweers opening into the conduit.

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158. Tube Joints for Condensers; Horatio Allen, City of New York.

Claim—Making the joint formed by two metal surfaces (as in the joints of the tubes in the tube sheets of surface condensers, and other similar instruments,) tight, by inserting between the tube and tube sheet a tube of seasoned or compressed wood, made either in one or several pieces, relying on the expansion of the wood after being saturated by water to make the joint tight, and on the freedom of the metal tube to move endwise without affecting the tightness of the joint, to avoid injurious results from the expansion and contraction of the metal tube.

159. Connecting the Ends of Railroad Rails; K. H. Allen, Worcester, Massachusetts.

Claim—The combination of the rails, elliptical or spheroidal band, chair, and adjustable wedge.

160. Knife Cleaner; J. J. Banta, Jersey City, New Jersey.

Claim—The combinations of the cushions and hopper with the spring.

161. Combination of Electro and Permanent Magnets to render Telegraphing Magnets easy of Adjustment; Edmund F. Barnes, Brooklyn, New York.

Claim—The combination and use in a telegraphic line, or in connexion with telegraphic instruments, of the permanent magnet with the electro-magnet, to prevent the disturbing effect of atmospheric electricity, &c. Also, constructing the permanent magnet as an armature of the electro-magnet, with soft iron inserted therein, to render its action more forcible in connexion with the electro-magnet.

162. Twine Box; W. R. Bennett and C. Storer, Boston, Massachusetts.

Claim—In combination with the box, the eyelets attached to the shaft. Also, the knife guard.

163. Washing Machine; William Brown, Duncannon, Pennsylvania.

Claim—1st, The manner of hinging the forward portion of the rubber to the rear portion of the same. 2d, The manner of hinging the rubber to the uprights, in combination with the manner of suspending the uprights by means of slots, pivots, and springs.

164. Machine for Sharpening Gin Saws; A. H. Burdine, Chulahoma, Mississippi.

Claim—1st, The arrangement of the adjustable feeding pawl, spring file frames, and slotted or jointed adjustable frame. 2d, The particular arrangement of the self-clamping and self-sustaining frame, in combination with the pawl, for the particular purpose of feeding old circular gin saws while on the shaft and in the grain frame. 3d, The particular manner shown of arranging the clamping part of the frame on the upper part of the frame.

165. Ploughs; G. D. Colton, Galesburgh, Illinois.

Claim—Arranging the frame, B, secured to the axle with the strap, cord, and windlass. Also, this in arrangement with the revolving colters and a double-pointed beam.

166. Machines for Cutting Out the Soles of Boots and Shoes; John Crawshaw, Rochester, New York.

Claim—Combining the cutter and the pattern with each other and with the wheel, by means of the pattern gear, pinion, groove, tongue, cutter carriage, slot, and the cutter stock.

167. Fire Boxes for Locomotive Engines; Leonard Crossman and Samuel Atkinson, Elizabeth City, N. J.

Claim—The arranging of the grate bars centrally in the bottom of the fire box of wood-burning locomotives, and surrounding said grates with dead plates, when said grate bars and dead plates are susceptible of being removed or replaced.

168. Manufacture of Hard Rubber Goods; Gustavus Cuppers, College Point, New York.

Claim—The improvement in the hardening or curing process of caoutchouc or india rubber and of gutta percha, by which articles, wares, goods and merchandize may be manufactured into any desired size, form, or shape, as described.

169. Steam Heater; Chauncey A. Dickerman, New Haven, Connecticut.

Claim—The arrangement of the chest of steam heating flues, mutually parallel and inclined, in combination with similarly inclined and parallel air flues heated thereby—both the steam and the air having passed once through its flue on passage across the chest, is at once discharged to its final destination.

170. Spring Bolt; Edward Doen, New Britain, Connecticut.

Claim—The combination with the guided sliding bolt and surface plate, of a loose or freely arranged spring let into the body of the bolt, and protected or encased thereby for operation on, at points some distance apart, and with the bolt and against the surface plate.

171. Grinding Mills; Gerrett Erkson, City of New York.

Claim—Combining with the two eccentric grinding plates having the said axis of rotation, a male and female nut, concentric with each other, and attached to, and rotating with, the eccentric plates.

172. Making Watch Cases; Edwin Field, Providence, Rhode Island.

Claim—1st, The use of the rolls, S S, in connexion with the rolls, F F, constructed as specified. 2d, The

peculiarly shaped threads, E 1 E 2, of the mandrel, to prevent flattening, and for properly stretching the centre stock in coiling the same in the first instance, E′, and for shaping and imparting a proper incline to the bevel stock in the second instance, E 2.

173. CARPENTER'S RULE; Wm O. C. Fritschler, Brooklyn, New York.

Claim—The arrangement and combination of the level with the movable arm furnished with a spirit level upon the centre, so that by means of the arc and the screw the glasses may be so placed as to indicate the precise position in relation to the "plumb and level," whatever may be the variation of angle the part b may necessarily assume, the said variation being indicated by the scale on the arc.

174. CANAL BOAT; James E. Gibson, Port Carbon, Pennsylvania.

Claim—In combination with canal boats made in two parts, so coupling the parts together that each shall have an up-and-down movement independently of one another.

175. SAW-FILING MACHINE; Heman How, Georgetown, Massachusetts.

Claim—The crank shaft operating in combination with the slotted, upright or moving frame, the flat spring, and the round metallic springs.

176. SEED DRILLS; J. W Kirk, Rising Sun, Maryland.

Claim—A seed hopper which has at each point of discharge two passages arranged alongside, and one a little in advance of the other, and both used at the same time, in combination with a seed slide which has two passages similarly arranged, and of equal depth with each other.

177. MACHINE FOR PRESSING GRAPES; Henry Krause, City of New York

Claim—The soft roller, in combination with the adjustable hard roller, by means of the cogged gearing.

178. CASTING HINGES; Conrad M. Lane, Cincinnati, Ohio.

Claim—Casting the knuckles of the respective leaves, so that the inner parts or sides of the knuckles will form parts of cylinders of smaller diameter than the outer parts, to admit of the easy moving of the joint without additional labor or finishing.

179. MACHINES FOR DIGGING POTATOES; Malcolm Little, Clyde, New York.

Claim—The arrangement of the fork within and in combination with the roller.

180. MILL STONE DRESS; George W. Loy, Jefferson, Texas.

Claim—Having the two stones, A B, provided respectively with straight and curved furrows, disposed or arranged as shown.

181. CASTING IRON KETTLES; Cornelius McGinniss, Pittsburgh, Pennsylvania.

Claim—Constructing the metallic core of three or more pieces, united by bolts so as to be readily detachable, one of which pieces is a narrow central strip, which may be removed after the kettle is cast, and before it is sufficiently cool to remove the entire core, for the purpose of allowing the contraction of the casting without danger of bursting.

182. VAPOR BURNING LAMPS; Nicholas Mason, Chelsea, Massachusetts.

Claim—1st, The two holes, q q. in the wick tube, for the purposes set forth. 2d, My cylindrical sheath, arranged and operating in the manner described. 3d, I do not claim cutting off the gas by means of rolling valves, as this is common in steam engines, and in gas and water cocks, and other lamps:—but I claim the double row or series of rolling valves contained within the mouth-piece of the burner, arranged and operating in combination with each other, and with the throat-piece of the wick tube.

183. PROPELLER; Datus E. Merrick, Cleveland, Ohio.

Claim—The special form of the wing, having its angular position upon the shaft, in combination with the flanch having its greatest depth at the central part of the periphery of the wing, and tapering therefrom each way to the edge of the wing.

184. BREECH-LOADING FIRE ARM; James H. Merrill, Baltimore, Maryland.

Claim—Converting what is known as the "Jenks' carbine" from a loose powder and ball-loader to a cartridge loader, viz: by plugging up the vertical opening through which that gun was loaded, cutting away in rear of the barrel, so as to load at the rear end of the bore, and allowing the lever, toggle, and piston to come far enough back to admit a cartridge to be dropped in behind the bore, and then run up into the chamber, with a groove and pin to guide the toggle and piston.

185. MACHINE FOR MAKING CHAIN; Edwin H. Perry, Providence, Rhode Island.

Claim—1st, The perforated plate, or its equivalent, in combination with a former for striking up the body of the link, the two so combined performing the function of enabling the link after it is struck up in the die to be lifted out of the same for the purpose of being deposited in the next position necessary in the formation of the chain. 2d, The arrangement of the slides for bending over the arms of each link after it has been struck up in the die. 3d, Constructing the end of the tube wherein the chain is formed, so that it shall be enabled to perform the function of grasping the link when deposited in it, and retaining it at the same time, holding it firmly in place while the arms of the under link are being bent over it. 4th, In combination with said tube the adjustable contracting collar, for the purpose of regulating the degree of resistance which must be overcome in forming the chain, by means of which the chain can be, at pleasure, woven more or less compactly.

186. METHOD OF FEEDING THE TOOL CARRIAGE IN TURNING LATHES; Adam Renulo, Binghampton, New York.

Claim—The combination of the lever with the arms, and the jointed propeller with the racks, and respectively, for the purpose of feeding the tool carrier. Also, the back rest, L, for the purpose described.

187. MACHINE FOR MAKING AXE POLLS; George Reynolds, Manchester, New Hampshire.

I do not claim, broadly, the method described of manufacturing an axe poll, by compressing a bar of metal between dies or swages projecting from the face of the rolls in which they are set. Neither do I claim as new the use of a die provided with a groove or recess in which the head of the axe poll is to be formed.

Claim—1st, The use of a drawing die, D′, provided with projections, so that the blank of metal when subjected to compression shall be thereby drawn out farthest at the corners, whereby the bit can be more completely welded into the poll, and the eye of the axe in consequence be made more perfectly. 2d, Making the lower die, D, with a recess or groove across its face of the form, so that the metal which forms the head of the axe poll shall be thereby crowded toward the edges of the head instead of being piled into a ridge in the middle, and at the same time a greater proportion of metal be forced into the back of the head. 3d, The combination

of the feeding fingers with one or more cams, so arranged that at the proper moment of time, the blank of metal can be by the machine automatically fed between the dies, to undergo the several operations to which it is to be subjected. 4th, In combination with the dies or rolls, an adjustable guide and gauge, either with or without the spring fingers. 5th, The compressing clamp for holding the axe poll and shaping the head of the axe during the operation of bending.

188. STRAW CUTTERS; Robert Sinclair, Jr., Baltimore, Maryland.

Claim—The arrangement of the teeth upon the masticating and propelling cylinder, constructed with the nodular projection on either side, and operating like molar teeth to propel and crush the fodder.

189. RAILROAD SWITCHES; G. R. Smith, Ithaca, New York.

Claim—The rack and pinion at the base of a perpendicular rotating or partially rotating shaft, when combined with a spring lever and a circle or a segment of a circle, said lever being fixed at right angles to said shaft, and playing on said circle or segment, and into slots in the same, and said segment or circle being horizontal. Further, the above named combination when further combined with a signal lantern, which lantern revolves wholly or in part, when adjusted to the top of said shaft, said lantern having different colored glasses, and revolving on an axis drawn perpendicularly through the centre of said lantern.

190. HEEL SHAVERS FOR BOOTS AND SHOES; Varanes Snell, North Bridgewater, Massachusetts.

Claim—Combining with the stock and the stationary knife the adjustable guard, so arranged as to be susceptible of being removed from the said stock.

191. FIREMEN'S TRUMPETS; Wm. Stachlen, Williamsburg, New York.

Claim—The end-piece and body, constructed in paraboloidal form, and arranged relatively with each other and the mouth-piece.

192. CLOTHES DRYER; S. H. Tift, Morrisville, Vermont.

Claim—The combination of a shaft, hubs, and arms, and braces, with the sliding collar and catch.

193. MACHINE FOR CUTTING BOTH BEVELS SIMULTANEOUSLY ON BARREL HEADS; A. D. Stewart, Bennington, Vt.

Claim—The arrangement and combination of saws, f g, saw, J, and mandrel, H, whereby both bevels are simultaneously cut.

194. STEAM STOVE; J. L. Sutton, Norristown, Pennsylvania.

Claim—A stove or furnace and boiler, with two or more concentric radiators around or above said boiler and furnace, and arranged to receive the air heated by said furnace and boiler, and impart additional heat to it as it ascends around and between them.

195. APPARATUS FOR HANGING UP AND CARRYING OFF PAPER HANGINGS; T. Van Deventer, New Brunswick, New Jersey.

Claim—1st, The employment of the intermediate bands, in combination with the hanging-up belts and carrying-off bands. 2d, The springs applied to the lath box.

196. MANUFACTURE OF STEATITE ARTICLES; J. Von Schwarz, Nuremberg, Bavaria.

Claim—Preparing gas burners, or other articles of manufacture, from the natural substance known as steatite, in such a manner as to give said articles an intense degree of hardness, and also a capacity to resist high temperatures.

197. APPARATUS FOR RECTIFYING; Gardner Waters and J. W. Harnett, Cincinnati, Ohio.

Claim—1st, The use of solid plates with bent pipes, or their equivalents, instead of perforated plates in the beer column. 2d, The use of the exhaust steam regulator, in distillation, by this or other apparatus, whereby steam of any degree of tension may be taken from the boiler, and reduced to any less desired uniform pressure; and whereby the exhaust steam from engines may be regulated in like manner, using the exhaust steam from boilers, together or separately as may be desired. 3d, The combination of the beer and spirit columns with the exhaust steam regulator, with or without the whistle valves, acting as described.

198. PLOUGHS; Walter Warren, Penn Yan, New York.

Claim—The arrangement of beam and its portion, with the mould-board and its land-side portions, for the purpose set forth.

199. LOOMS; Joseph Welch, Philadelphia, Pennsylvania.

As a multiplier of the pattern wheel of looms has been used before, and patented by Barton H. Jenks, on the 24th of October, 1854, I do not claim, broadly, increasing the capacity of said pattern wheel by means of a multiplier. But I

Claim—As an improvement in the said multiplying apparatus, the arrangement and combination consisting of the extra ratchet wheel and its pinion, in connexion either directly or indirectly with the pattern wheel; the adjustable pawls, c′ and c″, on their actuating lever, and the prolongation on the usual operating pawl, c, of the pattern wheel, the said devices being arranged so as to effect the changes as desired, in number at any given point of the pattern wheel during its rotation.

200. ELECTRO-MAGNETIC HOUSE ALARM; Wm. Whiting, Roxbury, Massachusetts.

Claim—The improved house alarm, consisting of a combination of the following elements, viz: 1st, a series of electro-magnetic circuits; 2d, an indicator to designate the respective circuits; 3d, an alarm apparatus; 4th, the window or door springs—the whole operating to sound the alarm, and indicate the circuit attacked.

201. MACHINES FOR HULLING AND CLEANING RICE; David Henwood and James Stephens, Assignors to selves and T. F. Rowland, Brooklyn, New York.

Claim—The cylinder provided with wedge-shaped spiral grooves, inclining outwards and downwards, in combination with the stationary india rubber lining, or such equivalent lining that is firm enough to hull the grain, and yielding enough not to break much of it in the process of hulling. Also, making the top of the cylinder convex or conical with curved or wedge-shaped grooves, in combination with the stationary adjustable disk above it, lined with india rubber, gutta-percha, or some equivalent substance. Also, a cylinder covered with wire card clothing, in combination with a cylinder of perforated sheet metal, when both are made to revolve in opposite directions. Also, the huller covered by the first claim, in combination with the scourer covered by the fourth claim.

202. FLOURING MILLS; Samson Wolff, Vicksburgh, Mississippi.

Claim—Increasing or decreasing the effective grinding action or friction of the stones, without the necessity of changing the distance between the grinding surfaces, by having the spindle of the running stone

arranged between an unyielding but adjustable step, and a pivoted weighted yielding lever, in the particular manner specified.

203. Cotton Presses; R. G. Williams, Hannahatchee, Georgia.

Claim—So arranging the press in relation to the screw that any required length of lever for operating the press may be obtained, the press resting on the upper main sill instead of resting on the ground sill.

204. Clothes Rack; George Young, Jr., Saratoga Springs, New York.

Claim—The arrangement of the folding timbers with the central timber, by which the said folding timbers, when extended, form supporting legs in combination with the lower arms, widened for the reception of the supporting pins.

205. Soldering Iron; H. J. Behrens, Assignor to Charles S. Pomeroy, City of New York.

Claim—The use of a hollow soldering iron containing solder, with or without a valve to regulate the flow thereof. Also, the combination of a hollow soldering iron containing solder, with an opening through which the solder may pass as required in the process of soldering, its delivery being automatic to its use.

206. Straw Shakers; Leonard Ellig, Mill Creek, Assignor to Andrew Garrett, Myerstown, Pennsylvania.

Claim—1st, The movable bottom, in combination with the arms and spring. 2d, The movable cap, adjusted as described.

207. Burners and Wick Tubes for Vapor Lamps; M. Safford, Assignor to self and G. P. Kinney, Boston, Massachusetts.

Claim—The combination of the auxiliary wick with a lifter or rod, or with the same and extinguisher, so as to enable such wick to be moved in its tube, in manner specified. Also, in combination with the vapor generator and its auxiliary wick tube, a closing cap or extinguisher and one or more conduits applied in the wick tube, in manner as specified. Also, a foraminous wick tube, or its equivalent, in its combination with a main wick and an auxiliary wick, applied to it and to operate with it.

208. Horse Powers; Wm. Rider, Assignor to self and J. B. Sweetland, Almont, Michigan.

I do not claim broadly, a worm wheel and screw, as that is a well known mechanical device.

Claim—The arrangement and combination of the right and left screws placed in the shaft, in connexion with the worm wheels which gear into the screw, and are rotated from the driving wheel by means of the gearing.

209. Fluid Metre; E. D. Weatherbee, Assignor to self and Lorenzo Harding, Worcester, Massachusetts.

Claim—1st, The arrangement of the weighted tube, D, the vessels, H and A, when constructed as set forth. 2d, The combination of the siphons, J J, with the vessels, H H, and tubes, G, with valves, I I.

210. Converting Rotary into Reciprocating Motion; John J. Weeks, Assignor to Susan Weeks, Locust Valley, New York.

Claim—Forming the oblique arm on the rotating shaft, and placing the collar or hub with rod attached on said arm, the lower end of the rod being fitted in the slide.

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211. Stone-sawing Machines; Horace L. Arnold, Elk Horn, Wisconsin.

Claim—The particular means employed for operating the screws, to wit: the rack and pinion gearing, rack shaft, H, rack, n′, and the wheel, o′, pawl, I, and pinion, p′, placed on the shaft, F. Also, in combination with the above, the racks, m′ g′, attached respectively to the collar, l′, and shaft, G, and used in connexion with the pinion, h″, and pattern, K. Also, the plates, j, provided with inclined planes, q, and having rods, k, and slotted bars, t, attached, which bars are connected with adjustable arm, c′, whereby the saws are tilted or slightly raised at the termination of each stroke of the frame, and the saws also inclined, as occasion may require.

212. Self-adjusting and Embossing Telegraphic Machine; Edmund F. Barnes, Brooklyn, New York.

Claim—The use and application of the combined permanent and electro-magnets in the resident magnet. Also, the arrangement of the springs, or their equivalent, in connexion with the circuit breaker shaft and type wheel shaft, by which the circuit breaker arm and type wheel are caused to return to a given starting point after the completion of each letter, thereby causing the instrument to be kept constantly self-regulated. Also, the use and arrangement or combination of the circuit breaker wheel, D, with its undulated periphery, and the hammer and anvil, placed and arranged so that the revolution of the wheel, D, shall alternately connect and disconnect such hammer and anvil, and also connected with the main battery and line, for the purpose of closing and breaking the main telegraphic circuit. Also, the arrangement of the hollow shaft, and clutch, and arm, and the connexion therewith of the swing frame, by which the clutch wheel is made to take hold of such clutch on the hollow shaft to carry forward such shaft, and the circuit breaker and the arm, whenever any key is depressed. Also, the arrangement and combination of the vibrating lever and its nipple, with the escapement wheel constructed to cause the type wheel shaft to revolve step by step at every vibration of such lever. Also, the use and arrangement of the spring, L, with its adjusting slide and adjusting screws, for the purpose of regulating the action of the vibrating lever. Also, the arrangement and combination of the imprinting cam the paper propelling eccentric, and the type wheel releasing plane, being attached to each other and placed upon a common shaft, or otherwise, but so that it is impossible that they should get into different relative positions. Also, in connexion with such imprinting cam, and paper propelling eccentric, and type wheel releasing plane, the arrangement and combination of the rod, Z, bar, Y, and imprinting press, X, and the rod, e′, and the rod, o, which together cause the letter to be imprinted, the paper to be propelled far enough for the next letter, and the detent cog-wheel to be forced down, so that the type wheel may return to its starting point, and again forced up to touch the type wheel, and also cause each of these several things to be done at and in its proper time. Also, the arrangement of the armature, constructed of alternate plates of conducting and non-conducting metals, when combined with an electro-magnet, and used in connexion with telegraphic instruments, for the purpose of securing a more rapid vibration of such armature. Also, the arrangement of the coiled spring about the type wheel shaft, such spring being set up to and held at a given tension, and such tension being increased only a certain amount by the friction, for the purpose of securing prompt action to such shaft. Also, generally the arrangement and combination of the said several parts described.

213. Ploughs; Samuel R. Bliven, McDonough, New York.

Claim—The reversible share attached to the shaft and connected with the lever, in combination with the two mould-boards, the parts being arranged relatively with each other.

214. Omnibus Register; Louis Brauer, Washington City, D. C.

Claim—The employment of an elastic step, by means of the movable rods for operating the register plate and bell.

215. Coupling for Railroad Cars; George S. Bishop, Washington City, D. C.

Claim—1st, The squared chambered bumper block, when made to receive the sliding and block, to overcome the friction on pin and link. 2d, The lever, in combination with the pin, and block, and bumper head, and pin or handle. 3d. The peculiar manner of constructing the mouth of the bumper and its connexion with the V-shaped mouth of the block for holding the link to any desired horizontal angle, and by which the block may be tipped to prevent the link from being crippled, and also for holding the same in poise at any desired angle, the whole operated by lifting the pin.

216. Water-proof Cement; Abraham Brower, City of New York.

Claim—The composition composed of all the ingredients described, and in about the proportions for the purpose set forth.

[Note.—This composition consists of tallow, beeswax, resin, shellac, and glue.]

217. Bearing Blocks of Truss Bridges; Albert D. Briggs, Springfield, Massachusetts.

Claim—The method of increasing the bearing surfaces for the bearing blocks, by the employment of the combination of blocks or keys, and blocks, h h, the former being tightly fitted between the chord sticks and the said bearing blocks, and the latter between the ends of said bearing blocks outside of the chord sticks.

218. Method of Counterpoising Gasometers; P. T. Burtis, Chicago, Illinois.

Claim—The arrangement of the chains, e e, in combination with the weights, d d, and chains, a a, whereby when there is any tendency on the part of the holder, or the section thereof, to which said weights are applied, to work unevenly, the highest side is relieved from the counterbalance weights, and two of the said weights are brought wholly into action on the lowest side.

219. Plates for Burglar-Proof Safes; Ira L. Cady, Assignor to J. B. and W. W. Cornell & Co., City of New York.

Claim—Forming a burglar-proof combination plate by the union of a stratum of molten iron with one or two perforated face plates of wrought iron.

220. Sewing Machines; Luman Carpenter, Oswego, New York.

Claim—The combination of a tilting dog or cam, F, with its friction spring, H, and pivoted vibrating bar, G, when operated by the needle bar for feeding the cloth, in the manner described.

221. Axle Boxes, &c.; David Cumming, Sorrel Horse, Pennsylvania.

Claim—1st, The peculiar form of the outer end of the axle and tapering hole in box, F, when the said axle and box are arranged relatively to each other. 2d, The combination of the two inner portions of the box with the clasp.

222. Method of Cutting Boot Fronts; John Dick, City of New York.

Claim—Cutting a boot front out of a single piece of leather, or other material, to the form described, or to any other form, whereby it can be used (in making the same into a boot) without undergoing the operation of crimping.

223. Paints; J. S. D'Orsey, City of New York.

Claim—The paint composed of carbonate of lead or oxide of zinc ground in oil, mixed with carbonate of lime, and reduced by the compound vehicle specified, either with or without the addition of pulverized sand or sulphate of baryta and sulphate of copper.

224. Sewing Machines; Cornelius Donovan, Abington, Massachusetts.

Claim—The application or attachment to the sewing machine of the stop motion described, consisting of the lever, the cogged segment, the rack, the belt guide, the brakes, the crank, the springs, and the lever, h, the cam, the pulleys, and the belt running on them, the pulley, e3, arranged as described.

225. Sawing Machine; Wm. H. Doane and Carlile Mason, Chicago, Illinois.

Claim—The arrangement of the gearing in connexion with the levers and feed rollers, so that the rollers may be expanded and contracted without at all interfering with their rotation. Further, placing the rollers on the shafts, having the rollers hollow, provided with bearings which are fitted on the upper ends of the shafts, and also provided with pendent pins which are fitted over the drivers of the shafts, the upper journals of the rollers being fitted in adjustable bearings.

226. Operating Window Blinds; Andrew Ferber, Elizabeth City, New Jersey.

Claim—The rod fitted in one of the stiles of the blind, and provided with pins which are fitted in oblique slots, e, in plates, D, attached to the ends of the slats. Also, the rod attached to the slats, in combination with the spring fitted within the mortise and attached to the stile.

227. Harness Tug Buckle; John H. Feraw, Hinsdale, New York.

Claim—The double tongue, cog-wheel, and traversing bars, arranged and operating in the body or box, in a manner so as to adjust itself in lengthening out and taking up the traces.

228. Railroad Car Springs; John J. Fields, Brooklyn, New York.

Claim—The cup or receptacle formed with the larger cavity, the swell or ledge, the sloping or conical cavity, the elastic hollow cone or sheath, the inverted cone plunger or core part, through all of which the whole elastic principle or property of the material or substance used is brought into requisition, and the pressure or weight applied is equalized or diffused throughout the substance employed.

229. Stock for Holding the Cutters in Rotary Planing Machines; Ivers Gibbs, Worcester, Mass.

Claim—A planer arm of the external form, and having both longitudinal and vertical openings through it, for the purpose set forth.

230. Apparatus for Distributing Steam; Robert Hale, Roxbury, New York.

I do not limit myself to the exact form of "distributor" described, as it may be varied without departing from the spirit of my invention. For instance, if the distributor is placed in a corner of the tank, a quadrant shape may be found to be better suited to the position occupied by it, a flat cap may be placed over the funnel-shaped orifice of the connecting pipe, leaving an annular opening around it. Thus far I have spoken of my invention as particularly applicable to heating the feed water of engines, and it is my intention to employ my distributor in connexion with a method of separating a portion of the exhaust steam of locomotives, for the

purpose of heating the feed water, but it is obvious that it may be used to advantage whenever water is to be heated by the injection of steam as in bathing establishments and manufactories. I do not therefore limit myself to its employment for the purpose of heating the feed water of steam engines alone, but intend to employ it wherever it may serve to accomplish the end which I have in view.

Claim—The distributor described, or its substantial equivalent, operating as set forth, for the purpose of injecting the steam into the water in a thin sheet.

231. Valves in Gas Apparatus; August Hendricks, City of New York.

Claim—In the application of water valves to the main pipe of gas retorts, the use of a loose perforated cover.

232. Wheelwrights' Machine; Wm. Hinds, Otsego, New York.

Claim—1st, Combining regular perpendicular ways, both in the mandrel carriage and the head blocks, to operate conjointly in adjusting the augers to different positions for boring. 2d, The method of adjusting the hubs for boring by suspending and revolving them on gudgeons in a carriage that vibrates the other way on a pin, and is set and controlled by thumb-screws, the revolving motion of the hub being set and controlled by index wheels and the latch. 3d, The entire construction of the spoke-holder and carriage, embodied therewith, together with the catch or hook for controlling its motion. 4th, The wheel carriage and plates to be used on the ends of the hub to confine the motion of the wheel to the axis of the hub and axle.

233. Apparatus for Regulating the Supply of Water to Steam Boilers; Z. L. Jacobs, Hebron, Conn.

Claim—1st, The combination of a chamber having alternate communication, with a reservoir to receive a fluid, and a boiler or other vessel in which to deliver it, causing the fluid, when it rises to the desired height in the latter vessel, to check the passage of air and other aeriform bodies to the aforesaid chamber, and thereby to regulate automatically the flow of fluid from said chamber. 2d, The movable pipe, or its equivalent, in combination with the vessel, for the purpose of changing the line at which the fluid is to be sustained in the boiler or vessel. 3d, The ring and the plug, when constructed in the manner described.

234. "Flushing Valve" Trap for Sinks, Sewers, &c.; Samuel Matthews, City of New York.

Claim—The combination of the basin and valve with the overflow culvert in the trap.

235. Machinery for Piling Paper; J. C. Kneeland, Northampton, Massachusetts.

Claim—A combination composed of the following elements:—1st, a carrier made of endless belts and rollers, or their equivalents; 2d, holders or holding mechanism, consisting of a rod or roller, one or more flexible strips or bars, or equivalent devices; 3d, mechanism to keep each roller of the carrier from revolving, while such roller is drawing the paper along over the table; 4th, mechanism to cause the roller to revolve and discharge the sheet of paper at the proper time; 5th, a table, or its equivalent, to receive the paper from the carrier. And in combination with the above described laying mechanism or combination of mechanical elements, I claim one or more bars or guards, arranged so as to prevent the sheet of paper while being carried forward from being drawn against the rear edge of the pack on the table, and being torn or injured thereby.

236. Manufacturing Nails; John D. Krauser, Reading, Pennsylvania.

Claim—The process of making cut nails with improved points, that is to say, beveling both edges of the nail plate, so that the blanks shall be wedge-shaped at both ends, and forming the head by the action of the heading tool against the widest end of the blank.

237. Signal Lantern Switches; S. N. Lennon, Deposit, New York.

Claim—Attaching the colored glass plates or slides, two or more of which are placed at each side of the lantern to a pendulous frame, placed within the lantern, and arranged in such relation with the colored plates or slides as to operate in connexion with the switch lever.

238. Compound Rails for Railroads; E. E. Lewis, W. B. Dunning, and C. Wheat, Genoa, New York.

Claim—The cap and base rail, constructed as described, and keyed together as specified.

239. Paper Making Machines; Thomas Lindsey, Westville, and Wm. Geddes, Seymour, Connecticut.

Claim—The expanding lip or basin, in combination with the adjustable deckles and straps.

240. Bran Dusters; S. B. Manning, Allegheny, Pennsylvania.

Claim—The use of a separate chamber covered with coarse wire net work, in addition to, and in combination with, the ordinary chamber covered with fine gauze wire net work.

241. Churn; M. R. Marcell, Dansville, New York.

Claim—1st, In combination with the blower, the dasher, whereby a current of air blown through the dasher shaft is caused to issue from the dasher below the surface of the fluid in the churn in fine jets. 2d, The double deflecting plates, in combination with a churn box.

242. Hanging Carriages for Children; Gilbert Maynard, Greenfield, Massachusetts.

Claim—Forming the springs of the chaise, and the axle bearings of the wheels of the same, by means of a single rod bent and applied to the device, as described.

243. Grates for Steam Boilers; James Montgomery, Brooklyn, New York.

Claim—Combining with a boiler formed with a series of vertical water tubes, and the flue space among the said tubes communicating with the fire chamber at one end only, a grate made the whole, or nearly the whole length of the boiler, and with the fire door at each end.

244. Splice Pieces for Railroad Rails; Ellwood Morris, Philadelphia, Pennsylvania.

Claim—Splicing together the ends of the two rails by means of a plate or plates so bent and formed, and so secured to the opposite sides of the two rails as to embrace the lower flanches of the same, and have longitudinal bearings against the sides, and at points above and below the narrowest portion of the rails, leaving a longitudinal open space between these points, transversely through which space pass the bolts for securing the splice.

245. Sewing Machines; Charles Moore, Buffalo, New York.

Claim—The elastic compression plate constructed with an offset or face which projects through the bed plate, and performs the combined functions of supporting the cloth equally upon all sides against the puncture of the needle, and of producing an equal pressure upon the cloth upon both sides of the seam or line of stitch when in the act of feeding. Also, the self-expanding looping springs, in combination with the slotted hanger and springs.

246. Closet for Milk; Edward H. Nash, Westport, Connecticut.

Claim—The box or case, in combination with the rotating shaft and shelves, arranged as specified.

247. STEAM BOILERS; Orrin Newton, Pittsburgh, Pennsylvania.

Claim—The mode described, or its equivalent, producing a more perfect calorification and expansion of the steam after it leaves the prime steam generator, and before it enters the cylinders of the steam engine, by means of two or more steam chambers, constructed as described, separate from the boiler, and heated by hot air from the furnace; the steam thus anhydrated passing to the cylinder of the engine from one of these separate chambers, while the steam in the other chamber is being prepared for the next stroke of the engine.

248. WHEAT DRILLS; Edward O. Bryden, Lafayette, Indiana.

Claim—The combination and arrangement of the cutters and teeth, with the concentric halder holders and levers, E E, and the combination and arrangement of the slides and the levers, P P, with the pitmans and cranks.

249. ADJUSTING MOSQUITO BARS; F. C. Payne, Hebron, Connecticut.

Claim—The application of the slotted projection, the hanging weighted arm, in the manner described.

250. COMBINATION OF THE NEEDLE AND SUN-DIAL TO ASCERTAIN TIME; Charles R. M. Pohle, Richmond, Va.

Claim—Combining the magnetic needle with the sun-dial, so that the point of compass is at all times at hand, and thereby the time of day ascertained from the dial, by holding the dial horizontal, and due north and south.

251. GRATES FOR LOCOMOTIVE ENGINES; Joseph W. Pole, Philadelphia, Pennsylvania.

Claim—The construction of the tubular bars, with hollow upward projections fitted with movable top pieces, as and for the purpose specified.

252. GAS REGULATORS; J. H. Powers, Newark, New Jersey.

Claim—The arrangement of the annular pressure cup and regulating valve, in the double annular quicksilver basin, whose inner and outer channels are arranged at a distance apart to form between them a passage, through which a communication is established between the interior of the cup and the atmosphere.

253. COMPOUNDS FOR TREATING POTATO ROT; Lyman Reed, Baltimore, Maryland.

Claim—The treatment of the potato preparatory to planting to the process set forth, subjecting it to solar or artificial heat, and then to the action of the liquid described, or any other analogous or equivalent thereto.

254. MODE OF OPERATING THE MECHANISM OF PRINTING TELEGRAPHIC MACHINES; Thomas and Joseph Reeve, and Sidney M. Tyler, Brooklyn, New York.

Claim—1st, Arranging the keys in a flat plate or key-board, in a semi-circular form, securing thereby a direct connexion between such keys and the swing frame. 2d, Applying the points or clutches at a distance from the shaft, and in connexion therewith making such a shaft a round instead of a square. 3d, The use and application of an independent friction upon the type wheel shaft, to secure in connexion with the coiled spring more prompt and instantaneous action to such shaft and the type wheel thereon, whenever the magnet releases the escapement wheel. 4th, Disconnecting the receiving portions of the instruments from the transmitting portions, to assist the operator in transmitting.

255. BRICK MACHINES; S. C. Salisbury, Milwaukie, Wisconsin.

Claim—The large cylinder, in combination with a series of small cylinders, spring guard plates, and die box. Also, cutting the bricks of the required lengths from the continuously moving body of clay, by means of the double knife passing through the forming die.

256. COUPLING FOR HORSE RAILROAD CARS; Blaney E. Sampson, Boston, Massachusetts.

Claim—The method of constructing and applying the pole so that it shall be in position to shackle when brought against the platform at any common angle of presentation. Also, so applying the pole that it shall be supported by the car, instead of upon the horses, as is usually done.

257. THE PRODUCTION OF ILLUMINATING GAS; J. Milton Sanders, Cincinnati, Ohio.

Claim—Carrying the mixed vapors of water and hydro-carbon, formed in the manner described, into a retort, containing carbon at a high red heat, for the purpose of producing an illuminating gas.

258. CLOTHES WRINGER; Isaac A. Sergeant, Springfield, Ohio.

Claim—1st, The yoke provided with a suitable hitching arm, the said yoke being adapted to be temporarily attached to a wash tub, or readily disconnected therefrom, and employed as a bearing for a rotary clamp for wringing clothes. 2d, In connexion with the yoke, the movable clamp, and pawl, and dog, by means of which the said clamp is retained within the yoke, or may be readily removed therefrom at will to be cleansed or dried. 3d, In connexion with a rotary clamp for wringing clothes, the hinged and yielding hitching arm.

259. MACHINE FOR WEIGHING AND REGISTERING GRAIN; J. Scheitlan, Columbia, South Carolina.

Claim—1st, A bucket with two compartments for a grain weighing and registering machine, which is suspended freely from the arm of the balance until the weighing is completed, and does not require to be turned or oscillated to dislodge the grain. 2d, The combination of a bucket with a tipping bottom to open and close the compartments alternately with a tipping tray. 3d, The combination of the roller arm, or its equivalent, with the scale beam and registering apparatus, in such manner that the same part of the mechanism which makes the count, also re-sets and locks the tipping bottom, so that no miscount can be made.

260. FEEDING QUARTZ, &c., TO MACHINES FOR CRUSHING AND GRINDING THE SAME; Charles Powell Stanford, Mount Gregory, California.

Claim—The arrangement of a lever which is adjustable by a set screw in connexion with a shoe, in such a manner that said shoe is agitated by the dropping of the stamper, and some of the quartz, or other substance, is caused to fall into the pan or mortar at such a time and in such a quantity as desired.

261. CORN HARVESTERS; Albert Stoddard, Tecumseh, Michigan.

Claim—The combination with the main frame of the pinion, E, shaft, G, pinion, H, cog-wheel, I, saw, J, shaft, K, reel, L, guard, P, wheel, X, belt, W, shafts, V V, their pulleys, U U U U U, endless belts, T T T, hopper, Z, its pivot and slide, 4, bar, 3, and caps, 5, when these several parts are arranged as set forth.

262. HORSE POWER MACHINES; James A. Stone, Rochester, New York.

Claim—The construction of the base when combined with the wheel, I, to form a trussed arch, whereby not only is great strength secured, but the length of the shaft and its consequent liability to vibration is lessened.

263. COMPOUNDS FOR PROTECTING TREES FROM INSECTS; Wm. W. Taylor, Dartmouth, Massachusetts.

Claim—The application of the bitter water left in the manufacture of sea salt, or its equivalent, to destroy canker worms, and other insects, in their attempts to ascend trees, as set forth.

264. Seed Planters; J. H. Thomas and P. P. Must, Springfield, Ohio.

Claim—1st, The use of flaring inclined gutter-shaped arms on the shaft, which is arranged in the hopper, G, and lifts and agitates the grain, in combination with the peculiar construction of distributing slide described. 2d, The employment of the above wheat hopper, G, and its attachments, in combination with a grass seed hopper, H, and the flaring seed conductors, when said grass seed hopper and flaring conductors or spreaders are arranged behind the wheat hopper, and so located that the back board of the wheat hopper shall completely overhang the same.

265. Clothes Dryer; Stephen H. Tift, Morrisville, Vermont.

Claim—The arrangement of the light yielding bars, cords, or ropes, standard and light yielding legs.

266. Machines for Cleaning Grain; B. T. Trimmer, Rochester, New York.

Claim—Giving the screens an unequal, reversible, gyratory motion, for the purpose of neutralizing the centrifugal force of the grain, and retaining it in the centre thereof, in combination with the vertical vibratory motion, by means of the double reverse-acting cranks, cams, and springs, or their equivalents, arranged in the manner set forth. Also, the combination and arrangement of the blast generator, triple blast tubes, and their valves and removable diaphragm, with the screen box and return spouts, operating conjointly for separating, screening, and returning the grain, and for increasing, diminishing, and modifying the blasts for the various purposes required. Further, the adjustable deflector, in combination with the screen box for returning the lighter grain through the screen, and re-subjecting it to the blasts, or discharging it as refuse.

267. Triangular Brace for Locking the Panels of Field Fences; Charles Van De Mark, Oak's Corners, New York.

Claim—As an improvement on the patent of June 2d, 1857, the brace, constructed as specified, when combined with panels formed as set forth, with the end locking pieces, and set together in a straight, or nearly straight line.

268. Butter Machine; Ellyson Yerby, Washington City, D. C.

Claim—The slide, as a disconnecting apparatus, when said slide is used in combination with the conical pan and agitator.

269. Railroad Car Brakes; Wilbur B. Wait, Portsmouth, New Hampshire.

Claim—The combination and arrangement of the frame together with the connecting joints with latch attached, the shaft, I, with drum attached, connecting with the shaft, A, by an eye, the belt passing round the axle, E, the lever, K, the levers or arms, C, with brake chains and rods attached, the guide bar and slot, the main shafts with cog-wheels attached thereto, and the slots and eyes or links, as described.

270. Making Steel Rollers; Henry Waterman, Brooklyn, New York.

Claim—My improved compound rollers, consisting of the steel shaft, the iron cylinder, and the steel cylinder, forming the surface when fitted together and hardened in the manner specified.

271. Alarm Gauge for Steam Boilers; Joseph Whitmore, Lowell, Massachusetts.

Claim—The combination of the steam whistle, W, valve, E, rod, L, spring, K K', and its connexions, and box, D, when used in connexion with a steam boiler.

272. Drawing Instrument; Wm. W. Wythes, Philadelphia, Pennsylvania.

Claim—1st, Causing the adjustable pencil-holder to revolve as the beam is turned on the adjustable centre, m, by means of the disk and endless chain, with the wheels and pulleys (or their equivalents), acting in conjunction with the same. 2d, The adjustable sliding piece, with its spindle and adjustable pencil-holder, when arranged as set forth. 3d, The spindle, d, with its adjustable bar, N, and pulley, f, and the spindle, e, with its adjustable bar, N, and pulley, h, in combination with the adjustable point and endless chain, the whole being arranged on the beam.

273. Pumps; Henry Zeng, Elizabethport, New Jersey.

Claim—The combination of a loose plate or disk valve with the piston rod in the upper part of the cylinder.

274. Mangles; D. Cumming, Jr., Assignor to D. Cumming, Sen., Mobile, Alabama.

Claim—The employment or use of the cylinder, B, having its axis fitted in fixed bearings, the cylinder C, having an elliptical surface on a portion of its periphery, and having its axis fitted in sliding bearings, and the wedges, D D, having weights attached.

275. Knitting Machines; Joseph P. Delahunty, Cohoes, Assignor to self and Edgar S. Ellis, Assignor to Clark Tompkins, Troy, New York.

Claim—So arranging or adjusting the presser and connecting it with the yarn running to the needles, that, when the yarn breaks or fails, the presser will move and cease depressing the barbs of the needles, and thereby preventing the casting off of the "quarter" or web.

276. Stoves for Burning Soft Coal; Merriman P. Dorsch, City of New York, Assignor to Peter Dorsch, Schenectady, New York.

Claim—The combination of the perforated cone and rosette when arranged with regard to the fire box, and operating as set forth.

277. Steam Heating Apparatus; Thomas Gordon, Assignor to Charles H. Bullard, Trenton, New Jersey.

Claim—1st, The application of water joints to the safety valve and steam pipes. 2d, The construction of the throttle valve with an inverted cup in a water-joint or case. 3d, Connecting the dome with a steam pipe by a water supply pipe. 4th, Arranging at the bottom of the radiator a caloric valve, as described.

278. Gas Regulators; Charles F. Holzer, Assignor to William B. Smith and Wm. Bromwell, Philadelphia, Pennsylvania.

Claim—The peculiar arrangement of inlet and outlet chambers, the valve, the inverted cup, the spring and guide pin, whereby the spring and the guide are effectually protected from contact with the gas, and provision is made for the return of all liquid matter through the inlet pipe.

279. Sewing Machines; Albert H. Hook, Assignor to Union Sewing Machine Co., City of New York.

Claim—A narrow space between the looper finger, e, and arm, in combination with the rough surface on g.

280. Illuminating Glasses for Vault Covers; Thaddeus Hyatt, Assignor to George R. Jackson & Co., City of New York.

Claim—Combining glasses of an inverted pyramidal, polygonal, or conical form, with the sash or metallic portion of an illuminating vault cover, or its equivalent, for the purpose of producing a wide spread and perfect diffusion of the rays of light which may pass through said cover into the apartment beneath.

281. Machines for Pegging Shoes; Leander Lackey, Sutton, Assignor to self and Elmer Townsend, Boston, Massachusetts.

Claim—The combination of the heavy inertia block with the weighted lever, and either the last or the standard for supporting the last. Also, the arrangement of the inertia block with reference to the lower bearings of the universal joint—that is, so that a vertical line passing through the centre of gravity of the inertia block shall fall on one side of, and at a distance from, the axis of such bearings. Also, combining with the inertia block and its universal joint a mechanism for revolving the inertia block twice while a sole on the shoe last is being pegged, consisting of the flanch, the griper, the connexion bar, the lever, the pitman, and the cam. Also, so arranging and applying the last standard on the inertia block, that the position of the standard may be varied on the block in order to change the inclination or slant of the pegs. Also, arranging and combining with the peg feeding mechanism, a mechanism for receiving each peg and condensing or compressing it just prior to its being driven into the sole, consisting of the slider, the hook, slide bar, the toggles, the pitman, and the mechanism for actuating the said pitman. Also, the combination of the wedged pitman, its side cam, the recessed post, and the stud of the feeder, the same being the mechanism for feeding the shoe along. Also, combining with the feeding mechanism a mechanism for imparting to the shoe last an intermittent, reciprocating, lateral motion, such as will cause the machine, when in motion, to insert two rows of pegs in the sole, consisting of the pitman, the notch, the recess, the stud, the heart cam, and the plate

282. Railroad Car Seats; John McMurtry, Assignor to James B. Clow and John Best, Fayette County, Kentucky.

Claim—The combination and arrangement of the seat back, foot-board, and quadrants, for the purpose of making the seat adjustable and reversible at pleasure.

283. Burners for Vapor Lamps; G. W. Randall, Assignor to Reuben J. Todd, Boston, Massachusetts.

Claim—The application of the valve and its seat to the generator and the button or heat absorber, the same consisting in making such valve and seat tapering, and arranging them in the generator, and maintaining them in contact by the action of a spring, and connecting the valve with a separate button in such manner that the button, besides performing its office of absorbing heat from the flame, may serve with the spring to maintain the valve in place against its seat and to rotate the valve.

284. Revolving Fire Arms; Edward A. Raymond and Charles Robitaille, Assignors to selves, Jno. B. Richards, and Thomas K. Austin, Brooklyn, New York.

Claim—1st, The manner of controlling the motions of the lever, h, and spring, i, by means of the spring, m, roller, q, and incline, 10. 2d, Locking the chambers, d, by the end of the lever, h, taking the triangular recesses in the rear of the chambers, as said lever completes its upward movement.

Extension.

1. Type-Casting Machines; David Bruce, Jr., Brooklyn, New York; patented November 6, 1843; extended July 6, 1858.

Claim—1st, The male plate, n, constructed with a nipple protruding beyond its back surface and springs attached to the plate. 2d, The method of opening and closing the mould and tilting the matrix, by the combination and arrangement of the compound vibrating arm, H, and lever, J, arm, M and N, and spring, V, said lever, J, having a simultaneous vibrating movement on an axis on the vibrating arm, H, in the manner set forth. 3d, The adjustable mould block, o, combined with the vibrating arm, H. 4th, The combination of the adjustable frame, h, with the lower adjustable mould block, o, in the manner set forth. 5th, The combination of the circular collar, perforated with a rectangular opening in the centre, to admit the rectangular shaft or stem of the upper mould block with the hinge piece and adjustable frame. 6th, The manner of supplying the melted metal to the mould by a horizontally and vertically perforated piston placed below the level of the bottom of the metal pot, by which the metal is forced into the mould at a lower temperature than heretofore effected, and the metal remaining in the mouth of the female plate, after the type has been cast, is drawn back into the seat or chamber of the piston as the piston rises, by which the mouth of the female plate is prevented from being stopped or choked by congealed metal. 7th, The combined arrangement of these several parts, namely, the lever, a, cam, v, spring, d, rod, b, and vibrating beam, E, by which the piston is operated, as possessing the advantages set forth. 8th, Placing the vibrating mould arm, H, between the furnace and the propelling or cam shaft, as described.

2. Machinery for Making Barrels and other Casks; Isaac Crossett, Bennington, Vermont; patented July 1, 1844; re-issued March 2, 1858; extended June 26, 1858.

Claim—The vibratory block or bed, adjustable gauge, and knife or cutter, arranged relatively with each other, so as to operate as set forth.

Re-Issues.

1. Method of Ventilating Ships, &c.; Rudolph Knecht, City of New York; patented November 11, 1856; re-issued July 6, 1858.

Claim—The ventilating of vessels, houses, rooms, or any other description of enclosed and covered spaces, by expelling the foul air contained therein, and by simultaneously introducing in its stead fresh air, cooled air, by a combination and arrangement of two sets of wings on one shaft, acting simultaneously.

2. Machines for Marking Time of Attendance of Workmen; Benj. T. Harris, Assignor to John McKillap, Assignor to Mary E. Harris, Brooklyn, New York; patented August 11, 1857; re-issued July 6, 1858.

Claim—The combination of a registering surface operated by clock-work, with markers so applied as to mark on said surface, and indicate the presence or absence of the employee or workman at or from the period of time denoted by the position of the registering surface. Also, a perforated plate, in combination with a slide, or its equivalent, whereby the presence or absence of the employee or workman to whom each perforation is alloted, is indicated, upon inspection, by means of black and white, or dissimilar colors, exhibited behind said openings.

3. Sewing Machines: W. O. Grover, Boston, and W. E. Baker, Roxbury, Assignors of the Grover & Baker Sewing Machine Co., Boston, Massachusetts; patented June 22, 1852; re-issued July 6, 1858.

Claim—1st, In combination with an upper needle or eye-pointed perforating instrument, a non-perforating eye-pointed instrument, so shaped and moved that it shall spread a loop of the thread it governs, while advancing through a loop of the upper needle thread. 2d, In combination with an eye-pointed upper needle, a non-perforating instrument having the function of carrying the loop of the upper needle thread out of the location or position in which it was originally seized. 3d, In combination with an eye-pointed instrument, an eye-pointed non-perforating instrument, such as described, and performing the two offices of spreading a loop of its own thread while advancing through a loop of the upper needle thread, and of changing the locality of the loop of upper thread that it has seized, both offices being performed in the manner described. 4th, An eye-pointed, upper needle and an eye-pointed needle, so arranged and operating as to make a stitch substantially such as is represented, in combination with a feed apparatus, one surface of which has motion in four different directions, in the manner described.

4. Sewing Machines; John A Ruckman, Assignee of J. E. A. Gibbs, Millpoint, Virginia; patented June 2, 1857; re-issued July 13, 1858.

Claim—1st, In the single thread sewing machine, I claim a hook or looper, revolving in one direction only, being so constructed as to make a series of chain stitches, when operating in connexion with a reciprocating needle. 2d, The peculiar construction of a revolving hook, whereby while one loop is taken from the needle by the hook, spread, twisted, and held in the path of the needle until another or fresh loop is taken, the former loop shall be released and drawn up during the retreat of the needle.

5. Machine for Folding Paper; S. T. Bacon, Assignee of A. Hardy, Boston, Massachusetts, Assignee of J. North, Middletown, Connecticut; patented April 15, 1856; re-issued June 27, 1858.

Claim—1st, Producing the fold over a stationary knife or straight edge by pressure upon the sheet, when in contact with the knife edge. 2d, The use of nippers so constructed as to fold the sheet over the knife edge, seize it and carry it to its proper position for receiving another fold. 3d, The method for releasing the sheet from the nipper. 4th, The adjustable check and the mode of releasing its hold by the advance of the nippers. 5th, Attaching the stationary knives to the reciprocating carriage. 6th, The combination of the crank, slotted connecting rod, lever, and link, for operating the reciprocating carriage. 7th, Hanging the cutting rollers on a bar vibrated and checked as described. 8th, The arrangement of the levers with double concentric shafts for operating the nippers from one cam.

6. Casting Skeins for Wagons; Andrew Leonard, Kenosha, Wisconsin; patented February 24, 1857; re-issued June 27, 1858.

Claim—The combination of a whole thimble skein pattern with a loose collar pattern. Also, the vertical position of green sand cores for thimble skeins, when moulded and combined at their base with the mould, in the manner specified, in combination with the adjusting top of the cores by the hand, after the mould is completed, except the case, whether core bars, or their equivalents for the purpose, are used.

Designs.

1. Types; James Conner, City of New York; dated July 6, 1858.
2. Printers' Types; James Conner, City of New York; dated July 6, 1858.
3. Printers' Types; James Conner, City of New York; dated July 6, 1858.
4. Range Fronts; A. C. Barstow, Providence, Rhode Island; dated July 6, 1858.
5. Bedsteads; Heinrich Neidig, City of New York; dated July 13, 1858.
6. Cooking Stoves; E. J Delaney, Philadelphia, Assignor to H. E. Marsh and Joseph Johnson, Lawrenceville, Pennsylvania; dated July 13, 1858.
7. Stoves; N. S. Vedder, Troy, Assignor to George W. Eddy, Waterford, New York; dated July 13, 1858.
8. Stoves; Garrettson Smith and Henry Brown, Assignors to J. G. Abbott and A. Lawrence, Philadelphia, Pennsylvania; dated July 20, 1858.
9. Pitchers; George W. Smith, Hartford, Connecticut; dated July 20, 1858.

MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

Contributions to Metallurgy, No. 1. By Fredk. A. Genth, Ph. D., Consulting Chemist and Metallurgist.

The difference in the appearance of a lot of Chinese coins, which were lately offered for sale in this city by a native of the Celestial Empire, and the little knowledge which we have on the subject of Chinese metallurgy, suggested the idea, that by a careful examination of the different kinds, some new and serviceable alloys might be added to those already used in the arts; or, at least, that by such an investigation, some information might be obtained of the Chinese ores, and the manner of their reduction. With the exception of three or four alloys, which have been repeatedly analyzed, we know hardly anything of the

metallic compositions used by the Chinese. I have endeavored to learn from the works, written on China, how their alloys were manufactured, what kind of ores they use for that purpose, whether they prepare their alloys directly from the ores, or by mixing the metals in the proper proportions, etc. Unfortunately, I have not been able to consult many books, and these have frequently given statements, which, on account of the want of familiarity with metallurgy of their authors, are unquestionably erroneous. So we find that different authors use not unfrequently the same name for altogether different substances.

The white copper of the Chinese, more than any other metal or alloy, appears to have attracted the curiosity of the writers on China. John Francis Davis,* who generally seems to be very well informed, speaks of it as an alloy of copper, zinc, and iron, with a little silver, and occasionally some nickel. The process of its manufacture, as he gives it, however, directly from the powdered ore, mixed with charcoal dust, and placed in jars over a slow fire, and the vapors condensed in water, leaves no doubt that the Chinese furnished him with their method of distilling zinc.

Of the same substance speaks undoubtedly Father Mailla,† who observes that the Chinese, besides the common copper, have another one of a white color, which is obtained directly from the ore, and is called Pe-tong.‡ He describes it as being whiter on the fresh fracture, but very brittle and hard, and mentions it as being frequently used in China; that it is necessary, however, to add Tutanegue or some similar metal to it, in order to render it soft and less brittle. The meaning of Father Mailla's Tutanegue is unintelligible. The word Tutanegue, or Tutenag, means zinc,§ but it is frequently, although erroneously, used for an inferior alloy of copper, zinc, and nickel. The richest alloy, composed of these three metals, the real Pack-fong, or, more correctly, Pack-tong, is undoubtedly the most interesting of all. The best kind, which contains nearly 32 ℔ cent. of nickel, has the color of silver of 18 carats; this alloy is sometimes called Electrum. There exists however in China a good many varieties, which contain a great deal less nickel. They are too well known to require repetition.

Another very interesting alloy is that from which the gongs are made, the so-called Tam-Tam metal. It contains about 80 ℔ cent. of copper and 20 ℔ cent. of tin. This composition seems to have been in use for many hundreds, perhaps thousands of years, for an ancient cast coffin, found on the east side of the Altai mountains, near the boundary line of China, gave on analysis the same substances, in almost exactly the same proportion. Of the other alloys of tin and copper, that which is called Chinese silver, and which is used for mirrors, is the most interesting; we have no analysis of it; but it has in all probability the same composition as our speculum metal, which is used for the construction of mirrors of telescopes or similar purposes; Davis says that it contains tin and copper, and perhaps a portion of silver.

* The Chinese. By John Francis Davis. New edition, London, 1851.

† Histoire générale de la Chine; traduite du Tong-kien-kang-mon. Par le Père Mailla.

‡ According to Stan. Julien (Compt. rend. xxiv, 1069) Pé-tong is an alloy of copper and arsenic.

§ Handbuch der Technischen Chemie von Ernst Ludwig Schubarth—Berlin, 1851.

Father Mailla states that the alloys used for coins are made from the materials furnished, since a very long period, from the provinces Yun-nan and Koei-tcheou. The coins are called Tschen, and are, according to Davis, composed of copper and zinc, with perhaps some lead. These are the only coins issued by the Chinese government, and their value should be equal to one-thousandth of the Chinese silver ounce or tael, which latter is equal to $1·40 of United States money. Their market value however was, when Davis made his observations, equal to 1240 tschen for one tael fine silver, although the expense of their manufacture was frequently greater to the government, so that the Viceroy of Fokien, in a memoir to the Emperor, suggested to close the mint of that province, and suspend the coinage altogether, until the relative value of Tschen and silver would approach nearer to a par. Although the value of one Tschen is not more than about one-tenth of one cent of our money, and the inducements to counterfeit the same cannot be very great, still the Chinese cannot resist their unconquerable propensity of substituting something of an even smaller value, that they forge them and smuggle casts of lead into circulation. The Tschen have an inscription on both sides: on one the name of the reigning Emperor, with two words denoting "current value;" on the reverse, a Tartar inscription. They have a square hole in the centre, through which they are strung together by hundreds to save counting. Most of the coins which I have seen were of this description, and they are certainly the most common. However, there are two other kinds, which are not mentioned by Davis, and of which I am therefore in doubt, whether they are government's issue, viz: of cast iron, and of an alloy principally of lead and copper. Of the cast iron coins I have seen only one. It had a square hole in the centre, like the Tschen, and similar inscriptions on both sides. It is very hard, but was so much oxidized that it was impossible to examine more closely into the nature of the metal. The other coin appears to be the same, of which Renouard de St. Croix speaks,* and of which he says, that it is called Patée, is made of an alloy of copper and lead, has a square hole in the centre, and only on one side an inscription. The analyses, No. 7 and 8, are in all probability this coin: it was impossible, however, to observe any inscription on either side, but as they are made of a very soft alloy, this may have been worn off.

All the Chinese coins are casts, and are not struck or stamped. Many of those, which I have examined, showed the impression of the fine sand used for the moulds; others were hollow, others did not fill the mould completely, or were full of very minute cavities and air-holes; hence the specific gravity was in some found to be considerably smaller than it ought to have been.

A pupil of mine, Mr. George J. Pöpplein, of Baltimore, has at my suggestion made in my laboratory the following very careful analyses of the various Chinese coins.

The analytical methods adopted did not materially differ from those generally in use. It was found, however, that tin cannot be accurately determined by dissolving in nitric acid, etc. It was therefore always sepa-

* Renouard de St. Croix' Voyage, vol. iii.

rated in the usual way, but the binoxide of tin was afterwards decomposed by fusion with sulphur and carbonate of soda, by which method the small quantities of lead, silver, copper, and iron were converted into insoluble sulphides, whilst the bisulphide of tin and sodium was dissolved by water, etc. All the necessary precautions were also taken, to insure a complete separation of the zinc from the copper. The following are the results of Mr. Pöpplein's analyses:

No. 1. *Tschen.*—Color, pale brass yellow, greyish on the fresh fracture; very good cast, with very fine grain, and but very few air-holes inside; exceedingly brittle. It contains:

Copper, . . .	=	63·94 per cent.
Tin, . . .	=	2·29 "
Lead, . . .	=	6·02 "
Zinc, . . .	=	26·24 "
Cobalt, . . .	=	trace.
Iron, . . .	=	1·35 "
		99.84

No. 2. *Tschen.**—Color, pale bronze yellow; the composition was not homogeneous, and with the magnifying glass two alloys, one of a brass yellow, the other of a pale copper-red color, could be distinguished; the color of the fresh fracture was greyish; medium grain, brittle. It contains:

Copper, . . .	=	60·97 per cent.
Tin, . . .	=	0·05 "
Lead, . . .	=	1·56 "
Zinc, . . .	=	35·05 "
Iron, . . .	=	2·37 "
Silver and Cobalt, .	=	traces.
		100·00

No. 3. *Tschen.*—Thick brass yellow coin, very good cast of fine grain; not easily tarnishing. Sp. grav. at 25° Cels. = 8·497. It contains:

Copper, . . .	=	55·53 per cent.
Tin, . . .	=	0·33 "
Antimony, . . .	=	3·21 "
Arsenic, . .	=	3·44 "
Lead, . . .	=	1·03 "
Zinc. . . .	=	32·74 "
Nickel, . . .	=	0·54 "
Iron, . . .	=	2·38 "
		99·20

No. 4. *Tschen.*—Brass yellow, with a greenish tinge, a very good cast; fine grain, brittle; easily tarnishing. It contains:

Copper, . . .	=	59·14 per cent.
Tin, . . .	=	2·71 "
Lead, . . .	=	3·40 "
Zinc, . . .	=	29·62 "
Iron, . . .	=	4·83 "
Nickel, . . .	=	0·17 "
Cobalt and silver, . .	=	traces.
		99·87

* H. Onnen (Scheik. Onderz. iv. 517 ff.) has analyzed a similar alloy from China, of a copper red color.

No. 5. *Tschen.*—Bronze yellow, greyish on the fresh fracture. Spec. Grav. = 8·552. It contains:

Copper,	=	59·983	per cent. (from the loss.)
Tin,	=	1·204	"
Silver,	=	0·068	"
Lead,	=	3·977	"
Zinc,	=	32·114	"
Nickel,	=	0·552	"
Iron,	=	2·102	"
Arsenic,	=	trace.	
		100·00	

No. 6. *Tschen.*—Color, bronze yellow, the fresh fracture brass yellow; the grain is coarse and crystalline, with many cavities; did not fill the mould well; very brittle. Spec. Grav. = 8·166. It contains:

Copper,	=	60·19	per cent.
Tin,	=	1·81	"
Lead,	=	5·83	"
Zinc,	=	31·57	"
Iron,	=	1·34	"
		100·74	

No. 7. *Patée.*—Not homogeneous, but a mixture of a grey and pale copper-red alloy; full of very small cavities, cuts easily with the knife; brittle. Spec. Grav. = 8·517. It contains:

Copper,	=	59·88	per cent.
Tin,	=	7·90	"
Lead,	=	31·42	"
Zinc,	=	0.59	"
Nickel,	=	0·18	"
Iron,	=	0·35	"
Silver, Arsenic, and Antimony,	=	traces.	
		100·32	

No. 8. *Patée.*—Similar to No. 7, but of a coarser grain. Spec. Grav. above 9. It contains:

Copper,	=	51·20	per cent.
Silver,	=	0·03	"
Tin,	=	4·81	"
Lead,	=	42 25	"
Cobalt,	=	0·23	"
Iron,	=	1·36	"
Zinc and Nickel,	=	traces.	
		99·88	

From these analyses, it is difficult to come to any general conclusions, because the Chinese are not guided by certain and invariable rules in the manufacture of their coins, although they generally use a composition which might pass under the name "brass." This brass is certainly made by mixing copper and zinc together, and only seldom directly from the ore, as the ancients have done. We know, from the descriptions given by Father Mailla and J. F. Davis, that they make zinc, and also know that long before the manufacture of zinc came into use in Europe, the Dutch brought it from China. The copper, which is used for their coins, appears to be always very impure, and is evidently made from ores containing iron, sometimes with small quantities

of nickel and cobalt; analyses, Nos. 3 and 7, indicate the occurrence of antimonial and arsenical grey copper (Tetrahedrite) in China. Frequently, it seems, that the Chinese take at hap-hazard, what of alloys and metals they can get, melt it together, and cast their coins from that mixture. We have seen above, that alloys of copper and tin are frequently used in China; now it seems that they add invariably a small quantity of such alloys for the manufacture of their coins, because every analysis shows the presence of tin; but we know that ores of copper, containing tin at the same time, are not frequently met with.

It is very probable that the Chinese have had the same kind of alloys in use for perhaps more than two thousand years; it was of interest, therefore, to compare the composition of some ancient Roman coins with that of Chinese coins. I have been permitted by Rev. H. S. Osborn, for whom I have made analyses of coins of the Emperors Hadrian and Trajan, for his work on Palestine, Past and Present, to insert these in this paper.

No. 9. *Hadrian Coin.*—Of a bronze yellow color; the color on the fresh fracture is inclining to brass yellow; grain very fine. Spec. Grav. = 8·778. It contains:

Copper,	=	86·92	per cent.
Silver,	=	0·30	"
Tin,	=	0·72	"
Lead,	=	1·10	"
Zinc,	=	10·97	"
Iron,	=	0·18	"
Arsenic and Antimony,	=	traces.	
		100·19	

No. 10. *Trajan Coin.*—The color is bronze yellow, inclining to brass yellow; the fresh fracture is greyish; very fine grain. Spec. Grav. = 8·745. It contains:

Copper,	=	88 58	per cent.
Silver,	=	0·21	"
Tin,	=	1·80	"
Lead,	=	2·28	"
Zinc,	=	7 56	"
Iron,	=	0·29	"
		100·72	

Both coins were stamped, and not cast like those from China, and both were pretty tough, which is certainly owing to the smaller percentage of zinc and iron in the same. These alloys were beyond question made directly from the ore, and only the small percentage of tin appears to have been added afterwards.

Philadelphia, 6th September, 1858.

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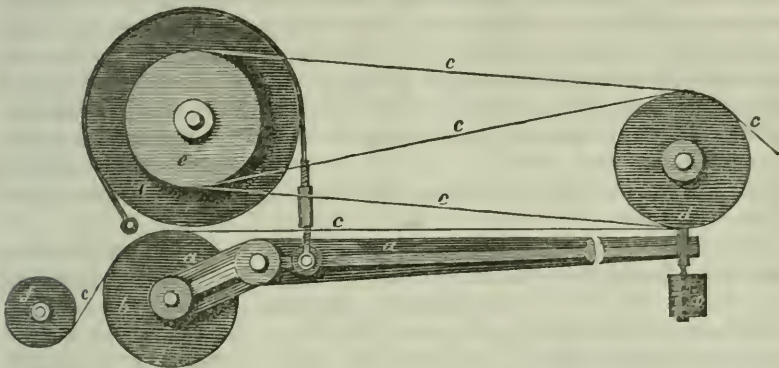
*The Atlantic Cable Apparatus.**

Gentlemen:—We beg to draw your attention to an apparatus we have invented for paying out telegraphic cables. Our object has been to render it impossible to have a greater strain on the cable than that

* From the London Mechanics' Magazine, July, 1858.

to which the machine might be set, no matter how much the ship might pitch or roll. This we confidently believe we have accomplished, by making use of that force which now snaps the cable in two, causing it to ease the breaks, and thus allow the cable to run free so long as an excessive strain continues. This can be easily made plain on inspection of fig. 1. *a*, *a*, is a lever carrying a weight, *w*, at one end and a friction pulley, *b*, at the other. The cable, *c*, *c*, *c*, on coming from the hold passes over the pulley, *d*, on to the pulley, *e*, which carries a break connected to the lever, *a*, *a*. It finally passes over the pulley, *b*, and under

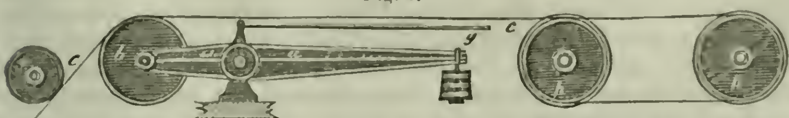
Fig. 1.



the pulley, *f*, into the sea. Now, the principal feature of our invention is this:—Whenever the strain on the cable is such that it causes a downward pressure on the pulley, *b*, greater than the balance weight on the other end of the lever, *a*, *a*, has been adjusted to resist, the pulley, *b*, must descend, the break end of the lever must rise, and the pulley, *e*, is left free to go round. The use of the pulley, *f*, is to maintain a constant angle between the cable going on to the pulley, *b*, and leaving it; otherwise the strain on the pulley, *b*, would not correspond with the strain on the cable.

Fig. 2 shows our break-relieving apparatus, which we have contrived in pursuance of the same principle, to be applied to the machinery now on board the *Agamemnon* and *Niagara*. Here, when the excessive strain comes on the cable, the pulley, *b*, descends, and a strain is put upon the rod, *g*, which may be used to take off the breaks from the pulleys, *h*, *h*, of the old machine. Although we have shown this

Fig. 2.



last application, we do not recommend it equally with the arrangement before described, but place it before you merely to show how the principle could be applied with the present machinery. A very slight inspection will show the superiority of fig. 1 in its entirety to the one in question (fig. 2).

It needs but few remarks to show to your readers, and to the shareholders in particular, the tremendous risk that is run by allowing a machine to be used which, in its very nature, allows the cable to receive the destructive strain before it can be recorded by the indicator, or the attendant on the breaks knows it is necessary to release them. This serious defect must be obviated, for the cable should never for an instant be suffered to endure more strain than is desired.

We here beg to draw your attention to the report of the trials, for the purpose of illustrating our argument. It will be seen that, with a pressure upon the breaks of 2000 lbs., the indicator recorded 6000 lbs. on the cable, proving that the machine carries within itself the very essence of failure, and affords a very natural reason why the cable has sometimes parted in the sea; for, after tugging and tearing through the machine (supposing it might escape breakage for the moment), it must be obvious that before it reaches the bed of the ocean it has still to bear the strain caused by the rising of the discharging vessel, under-currents, &c.; and consequently the part which successfully resisted the strain at first gives way upon this additional and unnecessary trial of its strength.

It has been suggested by one of your scientific contemporaries that the cable should have entire freedom. We agree with this to a certain extent, but still see the necessity of a proper and judicious check on its otherwise too rapid paying out, entailing a heavy loss by a needless expenditure; though, undoubtedly, entire freedom must be submitted to in the sudden and dangerous movements which of necessity will exist.

The important provision for safety, by allowing the cable to run free at the critical periods of its passage to the sea, we feel confident would be attained by the use of the principle we have now the honor to submit to you; and we have no doubt that, being now fully open to your criticism and that of your numerous scientific readers, the defects, if any, will be fairly shown. It is possible that, in carrying out the details, alterations in the disposal of the breaks and pulleys might be found necessary, but the principle of the machine we submit with confidence as the only one by which the much-desired instantaneous freedom can be given. Experiments would fully prove the truth of our assertion, but our humble position prevents our being able to test it by such means.

Believing that the splendid idea of conveying a channel for thought through the mighty waste of waters demanded the attention and co-operation of all men, we applied ourselves assiduously to the task of devising a machine combining within itself all the requirements of so important a preliminary. The result of our united efforts we have now the honor to lay before you, a description of the same having been previously published in the *Times* of the 18th September last, in a letter signed "Two Working Mechanics," and was also communicated to the Atlantic Telegraph Company, to whom a model was also exhibited; but, while eliciting the warmest approbation from many gentlemen of high scientific attainments, some in connexion with the Com-

pany and some not, it was only partially adopted by an approach to the principle of self-action; whereas, to be effectual, it is necessary to combine the whole in the manner now shown.

The growing desire and absolute necessity for the establishment of telegraphic communications to all parts of the world, render it imperative that in order to avert the sacrifice of so much valuable time and capital in the important preliminary of submerging the cable (such, for instance, as we have witnessed so recently in the case of the Atlantic Company), those who are charged with the onerous duty of supervising the operation should endeavor to avail themselves of the wisest counsels it is possible to procure, regardless of the source from whence derived, whether emanating from the brain of the hard-handed sons of labor, or their more eminent and learned brethren. It is but simple justice to those who have invested their capital in such important schemes, that no jealousy should be allowed to intervene to prevent the adoption of such a plan as would in all human probability secure the great end in view.

Disavowing any desire to condemn in a factious spirit the productions of others, we beg leave to assert that our sole object is to conduce, if possible, to the success of the gigantic enterprise now immediately under notice, or to any similar one that may hereafter be undertaken.

We are, gentlemen, yours, &c.,

James Mather,
Thomas Richards.

Woolwich, 19th July, 1858.

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*On an Improved System of Moulding and Casting.** By R. Jobson.

Amongst the few roads left open for improvement in the economy of moulding, increased rapidity of production appears to be the most available; but advantage can rarely be taken of this, except where there is great repetition in the article required, as in the case of railway chairs in all their varieties, shot, shells, castings for agricultural implements, pipes, troughs, stove and fender castings, &c. It is to this class of work, accordingly, that the moulding machine forming the subject of the present paper is more specially applicable.

The general construction of this moulding machine may be thus described:—There is a moulding table or bed, consisting of a rectangular cast iron box, open at top and bottom, and furnished with a large cylindrical axis at each end, turning in bearings on the side frames. The axes are prolonged at the ends, and counterbalance weights are attached to them by arms, which can be readily adjusted by lengthening or shortening, so as to balance the table with the mould upon it, leaving it free to turn upon the axes. To this table is fixed a plate, for carrying the moulding box, which is secured thereto by two inclined catches with handles. This plate forms the ramming board, upon which the pattern is fixed, and the moulding sand rammed upon it in the ordinary way. The machine is shown as arranged for moulding 8-inch

* From Newton's London Journal of Arts and Sciences, August, 1858.

shells, the pattern being a hemisphere; any pattern or form of flask within the limits of the size of the machine can, however, be readily employed, the only preparation requisite being to fix each pattern upon a bottom plate, having bolt holes to correspond with those in the top of the moulding table. This arrangement is so simple, that after the machine has been moulding shells, it can be changed and got to work again at moulding railway chairs or other articles within 10 minutes time.

As soon as the sand is rammed, a cover plate is put on the box, by sliding it on the inclined snugs, which hold it fast; the whole is then turned over with the moulding table into the reversed position; this being effected by the simple pressure of pushing home the cover plate, since the whole is balanced, and turns freely upon the axes. In moulding shells, the pattern is then withdrawn from the mould, sufficiently to make it clear the sand, by means of a screw and hand wheel, with which the pattern is connected. A rising platform, which slides in vertical grooves in the side frames, is then brought up, by means of a lever, to touch the cover plate of the box, which is now at the underside, and the box is liberated from the moulding plate by releasing the holding catches simultaneously. The platform, with the moulding box, now descends (by reason of the additional weight upon it) to its normal position, the platform being counterpoised by balance weights. The mould is then removed, by sliding it off the platform on to a little railway placed at the same level; and the machine is made ready for repeating the operation, by screwing down the pattern to its right place, and turning back the moulding table to its former position, ready to receive a second empty box.

The principle carried out in this machine, of turning over the whole moulding table, with the mould and pattern upon it undisturbed, has the effect of saving all labor of lifting the moulds; so that boys, who are sufficient for all the actual moulding work, are able to complete the process, instead of men being required to lift the heavy weights. An advantage in average quality of work, and saving of wasters is obtained, by avoiding all handling and risk of disturbing the moulds in lifting them off. They simply slide along a little smooth railway from the moulding machine to the casting ladle, which is fixed within 7 feet 6 inches distance from the moulding machine, centre to centre. A very important point is also gained by always replacing the pattern in its first position while still inverted, thus preventing any particles of sand from interfering with the working parts of the pattern.

The result of the working of the moulding machine is so successful, that one mould, consisting of two railway chairs, is readily completed every minute on one machine; and the machine is found to keep so completely in working order, that the regular day's work of 10 hours produces from 1000 to 1100 chairs, being at the average rate throughout of two chairs per minute. This extraordinary rapidity of moulding by the machine could not be made fully available with the ordinary means of casting, on account of the large floor space required for casting with the necessary rapidity, and the consequent delay and expense

attending the removal of the moulds over that space; and a great objection experienced at first, in regard to economy of work, was the large number of moulding boxes to keep even one machine going at the full rate. To meet these difficulties, a casting apparatus was designed by the writer, which is fixed close to the moulding machine: this is capable of filling the moulds as fast as they leave the machine, so that no loss of time or space occurs; and within two or three minutes the whole operation of moulding and casting is completed in each case, and the box laid out in the open air to cool, ready for emptying and using again on the machine within about six minutes time.

The ladle is placed in a standard frame upon the floor, the sides of which partly embrace the front of the ladle, and are connected together, at their extremities by a spindle, which passes through two corresponding lugs, fixed on the front of the ladle, just below the lip. This spindle forms an axis, upon which the ladle turns when pouring, and the ladle is lifted by means of a shaft fixed under the centre of the ladle, and connected by links to two hand levers, which are fixed to a common cross shaft. The weight of the loaded ladle is counterpoised by balance weights, connected by chains, which are carried over elevated pulleys to the shaft that passes under the ladle. From the position of the spindle on which the ladle turns, the lip of the ladle follows the direction of the stream of metal all the time that the ladle is being turned to its extreme position, so that the position of the stream of metal is stationary in all positions of the ladle; the several moulds are therefore only required to be brought to the same spot in succession, and the metal can be poured in at once, without any delay for adjustment of position; the moulds being filled as fast as they can be brought up to the ladle from the moulding machine. The command over the movement of the ladle, given by the hand levers, makes the pouring of the metal very steady; and the whole being nearly balanced, the caster tilts the ladle with one hand, whilst he skims the metal for himself with the other. A supply of fresh metal is brought from the cupola at regular intervals by a couple of laborers, with an ordinary double-handled ladle.

In casting railway chairs by the old system, it was considered a good day's work to obtain 300 castings from one man and his boys; and with the best plan the average does not exceed 480 per day.

With regard to the casting:—by the ordinary plan of carrying the iron and pouring it into the moulds, for casting railway chairs, six men and three boys were required to each table, and a long length of rails, together with a much greater number of boxes; but by the new ladle one man is enabled to cast all that can be moulded on one table, and two metal carriers are sufficient for two tables; so that two men can, in this department, do the work of nine men and boys, and with less labor, since they have not to stand in a constrained position with a heavy weight, as they were compelled to do in filling the moulds by the ordinary hand ladles. Also, the equality of the heat of the iron is greater from its being constantly supplied; and its purity is increased by being stirred up every time the hot metal is poured into the ladle, which is

a very important consideration in casting shot and shells. The regularity with which the process is carried on keeps the ground constantly clear, without bustle or confusion, and no one appears overworked.

The moulding table has been applied to moulding the wedges for Parson's railway chairs, weighing 4 lbs. each, 10 in a box; and the result has been the production of 5000 wedges per day from a pair of tables, while, by the old process, only between 900 and 1000 wedges per day were obtained. The writer understands that, at Ipswich, the machine has been applied to moulding bullock pans; and the result is, that four times as many castings are produced, and of better quality than before.

The saving in boxes, and in the breakage inseparable from the old system, would, the writer considers, in a very short time, pay for the moulding table, casting ladle, and all other extra outlay; and the common charges or incidental expenses are brought down to a minimum. The foundry room required for one set of apparatus for moulding and casting chairs is only 22 feet by 14 feet, or about 300 square feet; thus enabling any foundry already built to produce at least three times as much work as before in the same floor space. No more skill is necessary for working the machine than can be taught in an hour, and strength is quite a secondary consideration; the cheapest class of labor is therefore available.

Proceedings Inst. Mechanical Engineers, London.

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*Description of Wrigley's Friction Coupling for Shafting.** By Mr. Benjamin Fothergill.

This plan of friction coupling, which is the invention of Mr. Francis Wrigley, of Manchester, consists of a double set of powerful levers, each set forming what is called a knuckle joint, directly applied to a friction surface in motion, which is, by that means, brought into easy and gradual contact with another corresponding surface at rest, and there firmly held in position by the levers, without any other retaining force. By the effect of this frictional contact, any required amount of power may be transmitted from the prime mover to shafting, gearing, or other machinery, which has alternately to be set in motion, or brought to rest; and this is accomplished silently, and without the slightest shock or concussion to any part of the shafting, gearing, or machinery.

The sliding box (which moves on two fast keys or feathers, let into the shaft, and to which is applied the forked lever, for throwing the coupling into and out of gear) is connected by coupling bars to a pair of side links, which connect two friction blocks together. These blocks are surrounded by an external friction ring, which is bolted to a bevel wheel, bored out to fit the shaft, and run free upon it. A strong circular disk, keyed fast on the shaft, carries the two segmental friction blocks, their connexion with the disk being by means of snugs cast thereon, which act as drivers as well as guides for the friction blocks to slide on. Fitted into the friction blocks are case-hardened bearings,

* From Newton's London Journal of Arts and Sciences, August, 1858.

against which the circular ends of the connecting links abut; and these are capable of being lengthened or shortened, by means of adjusting screws, acting against the case-hardened bearings, by an inclined plane, so as to adapt the pressure between the friction surfaces to the power required to be transmitted. By this method of adjustment, the slightest amount of wear on the friction surfaces, or in the joints, can be compensated for with the greatest accuracy.

When the friction surfaces are brought into permanent or working contact, they require no sustaining power to keep them there; for to accomplish this it is only necessary to bring the inner centres of the links into line with their extreme centres, thereby forming a column, having no tendency to move out of line one way or the other. In the transmission of power, say from 25 horse power upwards, it is considered advisable, when convenient, to work the forked lever by means of a coarse pitched screw, for the purpose of engaging and disengaging the coupling; but for the transmission of a smaller power, a common hand lever is quite sufficient.

With regard to friction couplings and their application generally, it may be observed, that they have not been so extensively used as is desirable, not only for the prevention of accident, but in cases where occasionally only a certain portion of the shafting or machinery in an establishment is required to be put in motion. It appears, however, desirable that, in all extensive works and manufactories, there should be a friction coupling at the commencement of every main line of shafting; for by their application it is not improbable that many accidents, which now prove fatal, might be considerably mitigated, if not avoided, as the means would be at hand for stopping a line of shafting, or a room of machinery, at a moment's notice, without the too often fatal delay consequent on giving notice to the engineer to stop the engine.

An application of this friction coupling may, it is thought, be made with advantage, especially in heavy driving, in place of the ordinary fast and loose pulley, in which a considerable economy in the wear and tear of straps or belts might be reasonably expected; as the necessity for traversing the strap backwards and forwards on to the fast and loose pulley would be avoided. In addition to which, a further saving would be effected in the strap pulleys themselves, the driving pulley being required only half the width of those at present in use; for the friction coupling or driving pulley answering the double purpose of fast and loose pulley, the latter would not be required. Friction pulleys for this purpose might be made at a comparatively small cost, as they would require only one set of double levers, with their inner ends forked, so as to encircle the shaft, and connect the side links or coupling bars to the forked lever.

In arranging this friction coupling, it has been attempted to combine powerful and efficient action, simplicity of construction, and an easy and accurate system of adjustment against wear of the friction surfaces, with effectual means of increasing the power transmitted to any limit within the strength of the materials acted upon, together with cheapness and durability of construction.

Proceedings Inst. Mechanical Engineers, London.

*Steel Ships.**

In December, 1850, Mr. Ewald Riepe obtained an English patent for certain improvements in refining steel, which were described in No. 1453 of this Magazine, p. 476.† They consisted mainly in subjecting bars or lumps of raw or crude steel to the action of heat for about four hours in a furnace closed to the external atmosphere, the temperature being kept a little below the melting point of the steel. By this method of operation, carburetted hydrogen and oxide of carbon are developed in the furnace in abundance, while the oxygen of the air is entirely prevented from acting upon the steel, the working door of the furnace, &c., being carefully luted for this purpose.

This patent, which was permitted to remain in abeyance for some time, has lately been worked with very beneficial results by Mr. William Clay, of the Mersey Iron works, the steel produced by means of it having been found to possess a very fine uniform grain, and to be peculiarly suitable for the plating of ships. A new steamer of 170 tons, named the *Rainbow*, intended for the Niger Expedition, has been constructed of plates of this steel at the building yard of Mr. J. Laird, of Birkenhead. She was tried on the Mersey on Saturday last, and is to sail for Africa this week. Her dimensions are:—Length, 130 feet; beam, 16 feet. The hull is subdivided, by athwartship and longitudinal bulkheads, into 10 or 12 water tight compartments, for giving her greater strength, and rendering her more secure against accidents. Her engine is high pressure and of 60 horse power, working up to 200 horse power, indicated; and the boilers, which have also been made of Mr. Clay's steel plates, have been proved up to 200 ℔s. on the square inch, though they will only require to be worked at 50 ℔s. to 60 ℔s. The engine and boiler, as well as the hull, have been constructed by Mr. Laird. The advantage of employing this material over the ordinary iron plates is that, with about half the thickness, they are said to give equal strength with the best iron boiler plates, so that vessels are able to be constructed of considerably lighter draft of water than formerly, a result which is likely to be of incalculable benefit in the navigation of the shallow rivers of Africa and India. It will be remembered that Dr. Livingstone took out a small steam yacht the plates for which were formed of the patent homogeneous metal, manufactured by Messrs. Shortridge, Howell, and Jessop, of Sheffield. The advantage claimed for the Riepe steel is that, while possessing equal strength and adaptability for the purposes of ship-building, it can be more economically produced. Indeed, it is said that the process of manufacture is so simple, and the cost so little in excess of that of ordinary iron, that, by the saving of weight in the material, as compared with iron of equal strength, it will become absolutely cheaper. *Apropos*, of the strength of the steel, we may state that recent experiments, made by Mr. Clay in testing, at the Liverpool Corporation chain-proving machine, some samples of steel bars manufactured at

* From the London Mechanics' Magazine, July, 1858. † See page 277.

the Mersey Works, showed that their average tensile strength was 160,832 per square inch, while the strength of Russian iron is only 62,644; of English rolled iron, 56,532; Lowmoor, 56,103; American hammered, 53,913; of tempered cast steel, 150,000, &c.

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*Church of St. Isaac, at St. Petersburg.**

The consecration of the Church of St. Isaac, at St. Petersburg, took place on the 10th of June. It was performed with all the Imperial ostentation and military pomp usual on such occasions. The pageants and processions were grand; and good seats, at a window favorably situated, were paid for as high as 150 silver roubles each. "Mixing with the thousands who wonder at the splendor of this gorgeous temple, our eyes," says a correspondent, "are dazzled with the profusion of barbaric pearl and gold they meet at every glance. We see no wood, except in the doors; all the rest is granite, Carrara marble, iron, porphyry, malachite, alabaster, lapis lazuli, bronze, silver, and gold. Even the lightning conductors are of platinum. The five crosses, as well as the cupola of the building, are guilt with a mass of 274 pounds of gold, and are seen glittering at a distance of 40 wersts from St. Petersburg. One of the bells weighs 75,000 pounds. 112 granite columns, with Corinthian capitals, surround the building. They are each 56 feet high, and 7 feet in diameter at the base. Each is considered to be of a value of £1800 English money. The cost of the whole magnificent building is reckoned—though this is probably a gross exaggeration—at £13,500,000. The interior,—comprising a space of 60,000 square feet, and taken up neither by seats nor by organs (in the place of the organ there is a choir of 1000 men's voices),—is very imposing. The St. Isaac's Church has been thirty-nine years building. The aged, but still very active architect, M. Montferrat (who, at the consecration, followed in the Emperor's procession), has received a present of 40,000 silver rubles, besides a pension of 5000 silver rubles annually, which will also be paid to his widow, a picture of the Cathedral worked in gold and set with diamonds, and, lastly, the rank of a real Counsellor of State.

For the Journal of the Franklin Institute.

Atlantic Telegraph.

The subjoined Memorial was presented to Congress, as stated in its heading, upon the 29th of January, 1849. It contains the *first developed plan* ever promulgated for a telegraphic communication across the Atlantic Ocean. Horatio Hubbell, a citizen of Philadelphia, was its original projector and author of the memorial; he was joined by Col. John H. Sherburne in bringing it before Congress and the public.

The Memorial speaks for itself—the existence of a table land or plateau is there distinctly announced—and it is there first designated

* From the Lond. Athenæum, July, 1858.

as the spot for laying down the telegraphic connexion, as it has since been carried out, &c. The soundings and surveys of Lieut. Berryman, in the summer of 1853, more than four years after the Memorial had been published, fully corroborates its positions. A report upon the soundings of Berryman, and others, was made by Lieut. Maury, under date of 22d of February, 1854. But no personal survey was made by the latter.

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The following memorial was presented to the Senate of the United States by the Vice-President, the Hon. George M. Dallas, at the Session of 1849, (XXXth Congress,) and to the House of Representatives by the Hon. Joseph R. Ingersoll. In the Senate it was referred to the Committee on Commerce. In the House to the Committee on Naval Affairs. See Senate Journals for the second Session of the Thirtieth Congress, page 157, Monday, January 29, 1849. Also, the Journal of the House of Representatives, second Session of the Thirtieth Congress, page 337.

[Certified copy of the Memorial presented to the Senate.]

Memorial.

To the Honorable the Senate and House of Representatives of the United States, in Congress assembled:—

The memorial of Horatio Hubbell and John Henry Sherburne, respectfully sets forth:—

That they are desirous of establishing a telegraphic communication between this Continent and Europe. Believing this to be practicable, from many substantial reasons, they ask your honorable bodies to appropriate means by which this great project may be successfully carried through. *Your memorialists proceed to say, that from many observations which have been made, there is incontestible evidence of the existence of a submarine table land, extending from the Banks of Newfoundland across the Atlantic Ocean to the mouth of the British Channel.* This is proved by the altered color of the sea water, which has a different appearance in unfathomable places from what it has in shallow spots. This, combined with the volcanic construction of Iceland and the Azores, and the situation of that portion of the ocean that lies between both these volcanic groups, has led to the conclusion that there has been a lifting up of the bottom of the sea, through the agency of a Plutonic power, and that the bottom thus elevated appears to be cut through in many places by deep water channels. The appearance of Medusæ, Polypi, and other marine creatures seen upon the edge of the discolored water strengthens this opinion. Your memorialists propose that these suggestions should be further investigated, and that for this purpose they be furnished with a vessel, by a resolution of your honorable bodies, in order to make the necessary surveys and soundings. They also ask, if such shall be found to exist across the Atlantic Ocean, that they be furnished by the United States government with the necessary buoys, and the chains and anchors, in order to station the said

buoys at the necessary distances across the ocean, in order to establish a line of communication. The distance from Cape Race, in Newfoundland, to the headlands of Dingle Bay, in Ireland, being about 1900 statute miles, it would take only three hundred and eighty buoys, to have a buoy anchored every five miles the whole distance; while it is probable that a buoy at every 10 miles distance would be sufficient —in which case one hundred and ninety buoys would be enough. To these buoys a coated telegraphic wire would be attached, and sunk at such distance under water as would protect it from all molestation—while in the intervals between the buoys, the wire, if necessary, would be supported by cork floats attached to it.

Your memorialists think it unnecessary to enter into further details at the present time to show, for instance, what precautions would be adopted to prevent the chafing of the wires against the anchoring chains; or the means of diminishing the size of the buoys by sustaining their anchoring chains by lesser buoys or floats throughout the whole length of the chain, &c. The chief object of your memorialists at present being to direct the attention of Congress to this important subject—as your memorialists are of opinion that, though no soundings may be found, as indicated above, yet that buoys may be anchored by means of buckets, properly contrived and let down to a sufficient depth, so as to be clear of all currents moving on the upper surface, and supporting a column of water, while they re-acted on the water, so as to counterbalance the drifting movement of the buoys.

And this experiment, they pray may be fully tested; which, should it not succeed, contrary to the firm persuasion of your memorialists, will yet serve to elucidate several important phenomena. Your memorialists advert to the fact that the British Government are now about adopting the bold project of carrying the telegraph wire across the Irish Channel, and it remains for our Government, by their promptness and energy, not to allow themselves to be anticipated in the glorious enterprise of extending a telegraphic communication across the ocean itself.

All of which is respectfully submitted by your memorialists,

[Signed,] HORATIO HUBBELL,
[Signed,] JOHN HENRY SHERBURNE.

True copy, Y. P. PAGE,
Jan. 15, 1857. *Clk. in office Sec. Senate U. S.*

Specification of a Patent Granted to EWALD RIEPE, *for certain Improvements in Refining Steel.** (A communication.) December 5, 1850.

I take bars or lumps of raw or crude steel (particularly puddled steel), and in order to the refining of them, place them in a furnace or other heating chamber, out of the reach of any injurious action upon them

* From the London Mechanics' Magazine, June, 1851.

by the atmospheric air, and there subject them for a time to a temperature not exceeding the melting point of steel. I use for the purpose a welding furnace, such as is ordinarily employed in puddling iron, only that the bed is lowered and the grate brought from two to four feet below the level of the fire-bridge, and the ash-pit is provided with an iron door, by which it may be entirely closed when required. When the furnace is in full heat, I place the bars or lumps of raw or crude steel on the bed of the furnace, but at distances apart, so that they may nowhere touch each other; and during the whole of the refining process, the fire place is kept fully charged with coals or other fuel. Then, in order to exclude as much as may be the access of oxygen, I carefully lute any crevices there may be, in the working door or elsewhere, with wet clay, and so regulate the draft of the furnace by means of the ash-pit-door and flue-damper—closing them more or less, or altogether, as may be requisite—that the heat shall never attain to the melting point of steel. A sufficient practical test of this is furnished by the color of the flame, which is, with this view, carefully watched through an eye-hole in the working door. As long as it keeps of a dull or hardly red color, the heat will not be in excess of what is required. I usually put from 900 lbs. to 1000 lbs. of raw or crude steel, in bars 3 inches by $1\frac{1}{2}$ inches, into a furnace of the ordinary size, and continue the operation for about four hours. By this method of operation, carburetted hydrogen and oxide of carbon are developed in the furnace in abundance, while the oxygen of the atmospheric air is entirely prevented from acting on the steel; and the product is steel of a very fine uniform grain.

And having now described the nature of the said invention, and in what manner the same is to be performed, I declare that I do not restrict myself to the use of any particular form of furnace, nor to the subjection of the crude or raw steel to the refining process in any particular quantities or of any particular sizes; but that what I claim is the refining of raw or crude steel (particularly puddled steel), by placing it in a furnace or other heating chamber, out of the reach of any injurious action upon it by the atmospheric air, and there subjecting it for a time to a temperature not exceeding the melting point of the steel.

Specification of the Patent Granted to Charles Westendarp, Jr., *for Preparing a Material as a Substitute for Ivory, which he proposes calling "Artificial Ivory."**—Dated December 9, 1857.

My invention consists in manufacturing a material or materials which shall be made to imitate ivory, bone, horn, coral, or other similar substances, natural or artificial, and which may be used in preference to ivory and other such like substances, on account of cheapness and adaptability, as the same materials may be moulded or turned to the various forms or patterns they may be desired to take, and may be ap-

* From the London Repertory of Patent Inventions, No. 776.

plied (amongst others) to the following purposes, viz:—For billiard balls, door and other knobs, finger-plates, piano-forte keys, rulers, paper knives, knife and other handles, whip, stick, and other mounts, and in imitation or as a substitute for carved wood, enamelled china, precious stone works, and a variety of fancy, ornamental, and decorative work, such as figures, pilasters, mosaic pavements, panels, and other similar purposes, for which ivory, bone, coral, or such like articles are generally used, and, in order to explain my invention as completely as possible, I now proceed to describe the best means I am acquainted with for carrying the same into practical effect.

I take any certain quantity of small particles of ivory, bone, wood, glass, cotton, wool, or other similar articles, either in a coarse or fine powder, or in shavings, according to the imitation which is intended, and combine them or any of them, or any one of them, or all of them, or as many of them as I may see fit, according to the purpose required, with gums or other resinous materials, such as gum dammar, gum copal, resin, gum shellac, gum sandrac, wax, or other glutinous or resinous materials, also using which of the said gums I may see fit for the purpose the material is required for, either the whole of the said gums, or part, or any of them; these ingredients I combine by pressure or heat, or both, or with spirit, oils, or any similar vehicle or solvent, forming a mixture of the whole, or any of them, by mollifying, dissolving, or compressing the said small particles, with the said glutinous or resinous materials, thereby producing a substance of an ivory or wood-like appearance, which may be colored, dyed, or stained, during the process of manufacture or afterwards.

By the combination of the articles aforesaid, a paste will be obtained, which may be immediately moulded, and become solidified in a short space of time by means of heat or pressure, or both, or it may be so manufactured as to remain in a pasty condition for a considerable time, in order to allow it to be carried to any distance, or worked into any form, for instance, such as decorating in buildings, for mouldings, scrolls, or similar ornamental work; the hardening or drying materials being added at pleasure, according to the requirements of the work which is being performed.

The application of the material called "artificial ivory," may be very various besides those already named, as it is capable of being made to resemble sculptured articles, by means of dies or chasing, or it may be turned, carved, sawn, and polished, like ivory, bone, or other similar substances. In giving a precise description of the manufacture of the artificial ivory, I consider it will be sufficient to explain the method of making white billiard balls, as the various articles admit of such trifling variations that every one skilled in any handicraft can easily reproduce them. For example, I soak ivory dust, say five ounces, and a white color, say white lead or zinc white, three ounces, in a solution of eight ounces of white shellac or copal in sixteen ounces of spirit of wine. After the whole is well mixed, which is best done at a temperature a little below or above the boiling point of water, the alcohol is partially or wholly evaporated, and the stiff paste or dry powder pressed into a

solid mass in a pair of dies or mould, which have been previously heated to about 230 to 280 degrees Fahrenheit; after being so solidified, they are worked round and polished like the ordinary ivory balls. The same purpose is effected by reducing eight ounces of white shellac, three ounces of white color prepared of bismuth, lead, or zinc, with five ounces of ivory dust, bone dust, or any other suitable matter, into a fine powder, and by mixing this powder in passing it between heated metal rollers repeatedly, at about 230 to 280 degrees Fahrenheit; by this process a soft homogeneous mass is obtained, which can easily be moulded into any desired shape, and forms, when cold and hard, a very ivory-like material. Instead of using ivory dust, steamed and finely powdered bones, porcelain, cotton, and various finely powdered materials may be employed, and the colors may be varied according to the tint or shade required; the ivory or other dust may be dyed similar to cotton cloth. Gum dammar, copal, mastic, (and if great elasticity is required, bleached india rubber or gutta percha,) answer the purpose very well, either with or without shellac; bees-wax, camphor, and turpentine, are good for some of the purposes, and, according to the ingredients used, it will be perceived that the preparation must undergo various modifications, during the process of manufacture.

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*Experiments to determine the Strength of some Alloys of Nickel and Iron, similar in Composition to Meteoric Iron.** By W. Fairbairn, F.R.S., etc.

The object of the experiments in this paper was to ascertain whether an infusion of nickel, in a given proportion, would increase the tenacity of cast iron, as originally imagined from the analysis of meteoric iron, found to contain $2\frac{1}{2}$ ℔ cent. of nickel. Contrary to expectation, the cast iron when mixed with the precise quantity of nickel, indicated by the analysis of meteoric iron, lost considerably in point of strength instead of gaining by it. Hopes were entertained that increased toughness and ductility would be the result of the mixture; but the experiments which follow clearly show that there is a diminution in place of an increase of strength.

From the first class of experiments recorded in the paper, it appears that the nickel was prepared from the ore, and melted in the crucible, as follows:—

30 ℔s. of roasted ore.
5 ℔s. of pure sand.
2 ℔s. of charcoal.
2 ℔s. of lime.

These were kept six hours in the furnace, and, after being separated from the slag, the metal was cooled and remelted with half a pound of roasted ore and a quarter of a pound of pure bottle glass; about

* From the London Repertory of Patent Inventions, No. 776.

25 ℔ cent. of nickel was obtained. $2\frac{1}{2}$ ℔ cent. of this was fused with Blaenavon No. 3 pig iron, and run into ingots or bars, which were then subjected to experiment as follows:—

Results derived from one inch square bars, subjected to a transverse strain two feet three inches between the supports.

Description of Iron.	Breaking weight in pounds (B.)	Ultimate deflection in inches. (D.)	Power of resisting impact. (B × A.)	Comparative strength, Blaenavon representing 1000.
Exp. I. Bar D. Pure Blaenavon, No. 3	1131	·75	848·2	1000
" II. " C. Blaenavon, No. 3 Nickel	875	·58	507·5	773
" III. " B. Pure Cast Iron, No. 1	861	·47	404·7	761
" IV. " A. Cast Iron, No. 1 Nickel	637	·43	276·4	563
" V. " E. Pontypool, pure No. 1	798	·36	292·1	705
Mean, . . .	860	·52	465·8	760·2

From the above there appears to be a loss of 22 to 26 ℔ cent. as compared with the Blaenavon No. 3 iron; and in the next series of experiments made upon similar mixtures, but with perfectly pure nickel, the same indications of loss are apparent, but not to the same extent as in the preceding, as may be seen from the following results:—

Description of Iron.	Breaking weight in pounds (B.)	Deflection in inches. (D.)	B × A or power to resist impact.	Rates of strength F 2 = 1000.
Exp. VI. Bar F 1 without Notches,	867	·315	273	1000 : 876
" VII. " F 2 "	989	·380	376	1000 : 1000
" VIII. " G 1 with one Notch,	760	·331	231	1000 : 768
" IX. " G 2 "	899	·410	368	1000 : 908
" X. " H 1 with two Notches,	746	·286	213	1000 : 754
" XI. " H 2 "	703	·290	203	1000 : 810
Mean, . . .	829	·335	280	1000 : 838

Taking the mean of these experiments, it will be observed that the loss of strength is not so great as in the former, it being about 17 ℔ cent., or as 100 : 83. In the deflections and the power to resist impact, they are, however, inferior to those first experimented upon, as may be seen by the numbers, in the ratio of 465 : 280. This in some degree neutralizes the measure of strength, by a proportionate diminution of elasticity of the bars employed in the last experiments.

At the commencement of the paper, the author stated that the experiments were undertaken for the purpose of ascertaining how far, and to what extent, an admixture of nickel would improve cast iron; and that that improvement had reference, independent of other objects, to increased tenacity in the metal employed for the casting of mortars and heavy ordnance.

During the last two years innumerable tests and experiments have been made for that purpose with more or less success; but the ultimate result appeared to be, in the opinion of the author and others, that for the casting, or rather the construction, of heavy artillery, there is no metal so well calculated to resist the action of gunpowder as a perfectly homogeneous mass of *the best and purest cast iron* when freed from sulphur and phosphorus.

In the discussion which followed the reading of the paper, Mr. Calvert said that it was highly probable that nickel caused the increased brittleness of cast iron, just as carbon, phosphorus, and sulphur, but that the result with malleable iron might probably be very different; and, as meteoric iron is malleable, the trial could only be complete when soft iron and nickel were united; nevertheless, these experiments, as far as cast iron is concerned, were decidedly new and of great value.

Proceedings Manchester Society.

Meteors of 10th of August.

Mr. Benj. V. Marsh informs us, that on the evening of the 10th of August, of this year, he saw from 30 to 40 meteors between 9 and $10\frac{1}{2}$ o'clock, although not observing constantly. Fully nine-tenths of them, including all the large ones, were referable to a radiant situated approximately in R. A. 47° 30′, Decl. 58° N.; that is, near the stars B and C of the constellation Camelopard.

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*New Material for Moulds, &c.**

It is proposed to introduce a vast improvement in the casting of metals, by substituting compressed carbon for the sand or clay usually employed. The advantage to be derived is, that the same mould may be used over and over again without injuring the smooth surface of the cast material. The carbon to be employed, which is manufactured under a patent recently granted to Mr. Bühring, is comparatively pure, and can be moulded into any shape and form required. The same material has been successfully applied to the manufacture of crucibles, and these crucibles are by many considered superior to any others. Another purpose to which the compressed carbon is applicable is the manufacture of battery plates; and it is anticipated that electric telegraph companies would effect a vast saving in the cost of their batteries, by employing carbon in connexion with iron, instead of the zinc and copper plates now used. The development of Mr. Bühring's patent is entrusted to a public company, registered under the Limited Liability Act, and called the Moulded Carbon Company. The new material will, no doubt, be used in many cases in which carbon in any other form was valueless, or so difficult to apply that it could not be advantageously employed.

* From the London Mining Journal, No. 1199.

Trial Trip of the Steamer Sestos.

The new iron steamer "*Sestos*," built by Mr. Harrison Loring, at the "City Point Works," South Boston, yesterday made her trial trip down the harbor. About a hundred and fifty gentlemen, including many members of the City Government, composed the excursion party.

The *Sestos* is an iron screw steamer, of about 500 tons burthen, built for the Americans and a native house in Calcutta, for the purpose of carrying passengers and towing large ships up the Hoogly river. She is to be commanded by Capt. F. A. Sampson, who is a part owner, and has supervised her construction throughout. The following is a statement of her dimensions, thickness of iron, &c.:—

Length of keel, . . .	135 feet.
" on deck, . .	150 "
Breadth of beam, . .	26 "
Depth of hold, . .	14 "

Keel of forged iron, 7 feet by 2½ feet.
Frames 3½ by 3⅜ inch; angle iron, spaced 12 inches apart.
Floors of plate iron, 14 inches deep.
Garboard strake, 9-16 inch thick.
Bottom for two strakes, ½-inch.
To above turn of bilge, 7-16 inch.
Remainder to wale strake, ⅜-inch.
Wale strake, 7-16 inch.

The steamer is divided into three water-tight compartments, by bulkheads, one abaft the engines, one forward of the boilers, and one forward of the coal bunkers, all braced with double angle iron. The deck beams are of iron six inches deep. The two engines which operate the steamer are oscillating in their movement; diameter of cylinder 38 ins.; stroke of piston 32 inches. The boilers are "Martin's Patent Vertical Tubular boilers." The ordinary working horse power is 550; but that can be considerably increased. Thirty-three pounds of steam is the amount allowed by the certificate, but several pounds more can be carried with perfect safety. Upon ocean voyages the steamer will go under sail, having three masts, square-rigged at the fore, and schooner-rigged at the main and mizzen masts. All the standing rigging is of coiled wire. In matters of external finish, more regard has been paid to strength and durability than to beauty of appearance, yet the steamer wears a very trim and handsome look. Her cabin is fitted up elegantly. Mr. Loring has forged the iron, framed the wood work, put all the materials together, and completed a whole steamship at his own establishment, a fact which cannot be recorded of many men, however extensive their facilities. And all agree that the work has all been well done.

The trip was in every way satisfactory. The steamer, even in the roughest water, bore herself well, and her machinery performed its work smoothly and thoroughly, scarcely moving the ship at all, it being remarked by all, that there was no perceptible noise or jar—hardly more than would be experienced in a sailing vessel. The arrangements

for the occasion were complete, and the party were much pleased, the storm and rough weather being rather agreeable than otherwise.

The following is the record of the steamer's performance on the downward trip, under less than 24 pounds of steam, the propeller making an average of 35 revolutions per minute, and against a strong east wind and heavy sea:—

	h.	m.
Passed Grand Junction wharf, . .	12	59
" Fort George, . . .	1	12
" Long Island Light, . . .	1	32
" Nix's Mate, . . .	1	35
" Fort Warren, . . .	1	44
" Outer Light, . . .	1	58

On the inward trip, the pressure of steam was from 24 to 27 pounds, and the propeller made from 40 to 53 revolutions per minute, but there was a heavy sea and strong ebb tide.

	h.	m.
Passed Outer Light, . . .	4	06
" Fort Warren, . . .	4	15
" Long Island Light, . . .	4	24½
" Fort George, . . .	4	46
" Grand Junction Wharf, . .	4	59

Thus nine miles were made against a 2½ knot tide in 53 minutes.

The "*Sestos*" will make a two days' trip in the course of the present week, with a four-bladed propeller; the one used yesterday having but three blades. Next week she will leave for Calcutta.

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*Consumption of Smoke.**

A short time since, the owners of steam-tugs plying upon the Tyne, to the number of 150, received notice from the Inspector of Nuisances, of Newcastle-on-Tyne, under pain of being proceeded against for penalties under a local Act, to consume the smoke emitted by their boats, which at all times (but more especially on the occasion of busy sea-tides, when from 100 to 200 vessels have to be towed out at a tide,) issued from the funnels of the steam-tugs in thick volumes of the blackest density. The tug owners thereupon consulted Mr. Armstrong, engineer, of Elswick, and, by his advice, enlisted the services of Dr. Richardson and Mr. Reed, of Newcastle, under whose superintendence experiments have for some time past been carried on, at Elswick, near Newcastle, to prove the practicability of consuming the smoke produced by the coal raised from the great coal-fields of Northumberland and Durham.

It was arranged that one of the steam tugs should be placed at the disposal of Dr. Richardson and Mr. Reed, for the purpose of making such alterations in the furnaces as they considered would effect the desired object, and in order that, in case of success, the other steam-tugs might be altered in a like manner. The *Expert* steam-tug, belonging

* From the Lond. Civ. Eng. and Arch. Journ., Sept., 1853.

to Mr. Wm. Melbourn, of North Shields, was offered for the purpose, and a series of experiments were made upon the furnaces, the plan adopted being very simple, consisting of a proper admission of air into the furnace, which, combined with careful stoking, was expected to consume the smoke. After certain alterations were effected, the tug was taken to sea, with a party of steam-tug owners, and their solicitor, Mr. Kewney, and the inspector of nuisances, on board. It was found that the improvement effected was very great, upwards of 75 per cent. of the smoke being consumed, and the remainder being of a character far less offensive, being thin and light colored. The inspector considered that the result was very satisfactory.

Dr. Richardson and Mr. Reed were determined, however, to effect a perfect consumption of smoke, if possible; and made further alterations. On the 5th ult. the *Expert* proceeded to sea, on a voyage from Newcastle to Warkworth, a distance of 30 miles, having on board Mr. Miller and Mr. Taplin, government engineers (sent from Woolwich and Portsmouth to test the experiments going on at Elswick to consume the smoke, with a view to re-introduce the Northern coal into the naval yards); and also Dr. Richardson and Mr. Reed, and a party of steamboat owners and their solicitor. It was found that the alterations, which were of a simple character and comparatively inexpensive, entirely effected the consumption of the smoke, there being none whatever visible throughout the voyage out or home, except when Mr. Reed, in order to exemplify the efficiency of the system, stopped the admission of the air, and allowed the production of the smoke at pleasure, or the entire consumption, as he thought fit.

The other steam-tugs in the association, and the steam-ferries on the Tyne, will be fitted up with the apparatus forthwith, and it is anticipated that a great nuisance to the river and harbor towns of the Tyne, occasioned every sea-tide by a black fall of smoke hanging over them, and sometimes entirely obscuring the view of the sea, will be entirely removed.

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*On the Influence of Pressure on Chemical Affinity.** By Dr. Lothar Meyer.

In the twelfth volume of Poggendorff's *Annalen*, there is a note by Babinet which contains the proposal to use, as a measure of chemical affinity, the pressure which a gas generated by chemical decomposition must attain in order that the decomposition may cease. The author states that for zinc and sulphuric acid the limit is reached when for 0° C. the pressure of the liberated hydrogen amounts to thirteen atmospheres; at 25° C., on the contrary, this pressure exceeds the height of thirty-three atmospheres.

Experiments which I have made in Prof. Werther's laboratory do not agree with these statements. With the most varied strengths of sulphuric acid, even in the presence of large quantities of different

* From the Lond. Edin. and Dub. Phil. Mag., Aug., 1858.

sulphates, and by the use of citric and acetic acids, the pressure of the hydrogen liberated by zinc far exceeds the limits given by Babinet. The reason of this appears to lie in the fact that Babinet used copper vessels closed by a cock, while I used sealed glass tubes.

The decomposition appears, however, to attain a limit; at any rate the liquid, even with excess of zinc, has still a strong acid re-action after standing for months. But what the maximum of this pressure may be I have not been able to determine, inasmuch as the only tubes I could obtain which would stand the pressure were too narrow to allow a manometer to be introduced. The greatest pressure which I observed directly at the manometer was 66 atmospheres. The acid consisted of one volume SH^2O^4, and three volumes of H^2O; the temperature was 0° C. The tube exploded shortly after observing this pressure.—Poggendorff's *Annalen*, vol. civ., p. 189.

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*On an Experiment in Melting and Cooling some of the Rowley Rag.** By W. Hawkes, Esq.

About 31 cwt. of basalt was melted in a large double reverberatory furnace, and after a slow cooling during thirteen days, it presented an upper stratum of stony vesicular matter, about 1 inch thick, next a layer of black glass, from 2 to 8 inches deep on that side of the mass which was exposed to the air from the door of the furnace (elsewhere, immediately under the vesicular layer was solid stone, interspersed here and there with air-bubbles). Mr. Hawkes added some observations relating to the results of experiments which he had made to ascertain the temperature of melted cast iron, and of melted basalt.

Aluminium.†

We glean a few interesting particulars respecting this curious metal, from a work entitled *L'Aluminium et les Métaux Alcalins*, just published by MM. Tissier, gentlemen whom we have several times had occasion to notice in our accounts of the labors of the Acadamy of Sciences, and who, in the work alluded to, have enriched the history of that metal with many important observations of their own. It had generally been stated that aluminium could resist the highest temperature without absorbing oxygen, but we now learn that if the temperature be raised from a white to a welding heat, aluminium will burn with great intensity until a stratum of alumina be formed on its surface sufficiently thick to exclude the atmosphere. As regards alloys, that made with iron is not malleable, but will crystallize. An alloy of 100 parts of aluminium and three of nickel is more fusible and harder than the pure metal. Bismuth forms with aluminium, in the proportion of one to three, an alloy which is very fusible, but also very subject to oxidation when in a state of fusion. If two equivalents of aluminium and

* From the Lond. Edin. and Dub. Phil. Mag., Sept., 1858.
† From the London Mining Journal, No. 1201.

one of oxide of lead be exposed to a white heat, a violent detonation ensues, the crucible breaks into pieces, and even the doors of the furnace are driven to a distance. Similar effects occur with oxide of copper, or the sulphates of potash or soda. Aluminium is now much used for jewelry, especially bracelets, pins, and combs; in cabinet making, it is excellent for inlaid work; its lightness renders it extremely convenient for pencil-holders, thimbles, seals, small statues, medallions, vases, and the like; for spectacles, as it does not blacken the skin like silver. But one of its most useful applications consists in using it for reflectors of gas lamps, since it resists the effects of sulphurous emanations, which silver and brass do not.—*Galignani's Messenger.*

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, September 16, 1858.

John C. Cresson, President, in the chair.

John F. Frazer, Treasurer. }
I. B. Garrigues, Rec. Sec. } Present.

The minutes of the last meeting were read and approved.

Donations to the Library were received from the Geographical Society, Vienna, Austria; La Société Industrielle de Mulhouse, France; P. H. Thomson, Esq., Columbus, Tennessee; the City Council, Boston, Mass.; the Evansville Board of Trade, Indiana; and from Charles E. Smith, Esq., Philadelphia.

Donations to the Cabinets were received from Prof. John C. Cresson, Philadelphia, and Barnard Shipp, Esq., Natchez, Mississippi.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement of the receipts and payments for the month of August.

The Board of Managers and Standing Committees reported their minutes.

Candidates for membership in the Institute (6) were proposed, and the candidates (5) proposed at the last meeting were duly elected.

Mr. McWilliams exhibited his new design of an axle-box for railroad cars. The improvement consists in the facility with which it can be taken apart to renew the packing, which frequently forms into a mass so solid as to require hours for its removal from the boxes. Mr. McWilliams' is so arranged that by taking out a bolt the lower part, which forms the packing and oil reservoir, can be drawn outward, entirely clear, so that the packing is removed without difficulty in one mass. By elevating the car body, an opportunity is given for the removal of the brass box upon which the axle runs, while the upper part of the axle-box remains in its position. The inner end of the lower piece fits into a rebate cast in the upper piece, so that it remains in place at the inner end, while the outer end is secured by the bolt named.

Abstract of Meteorological Observations for July, 1858; made in Philadelphia, Somerset, Bedford, and Huntingdon Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

PHILADELPHIA:—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.

July, 1858.	Barometer. Mean.	Barometer. Mean daily range.	Thermometer. Mean.	Thermometer. Daily oscillation.	Thermometer. Mean daily range.	Relative humidity. 2 P. M.	Force of vapor. 2 P.M.	Rain.	Prevail'g winds.
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	
1	29·830	·063	77·8	15	9·8	35	·418		(var.)
2	29·757	·073	80·0	18	2·8	54	·648		S.
3	29·663	·094	82·7	15	2·7	76	·975	0·372	S.
☽ 4	29·657	·081	83·5	16	0·8	61	·815		N W.
5	29·974	·317	79·0	14	5·5	44	·530		N E.
6	30·114	·140	75·3	17½	3·7	35	·388		W.
7	29·934	·180	77·0	24	2·3	42	·542		S W.
8	29·841	·093	80·0	22½	3·0	45	·581		S S W.
9	29·845	·015	82·7	18	2·7	53	·750		S.
● 10	29·888	·043	86·3	18½	3·7	52	·799		S W.
11	29·823	·065	89·2	15½	2·8	49	·811		S W.
12	29 777	·046	84·5	15	4·7	48	·692		S.
13	29·709	·067	77·8	9	6·7	86	·827	0·810	S.
14	29·945	·146	74·0	10½	3·8	69	·651	0·100	(var.)
15	29·946	·021	78·3	15	4·3	54	·602	0·037	N.
16	29 929	·016	78 5	17	2·2	49	·588		N E.
☾ 17	29·928	·010	80·2	18½	1 7	57	·689		(var.)
18	29·928	·027	78·0	15	2·2	67	·730	0·020	S.
19	29·934	·042	77 3	18	1·7	32	·368		N E.
20	29·870	·064	73·0	15½	4·3	64	·577	0·040	(var.)
21	29·663	·207	77·2	15½	4·2	56	·622		S E.
22	29·611	·070	78·8	16	3 7	40	·510		(var.)
23	29·699	·088	74 7	19	4·2	39	·445		S W.
24	29 779	·080	75 0	17½	1·3	34	·382		NNE.
○ 25	29·955	·176	71·2	17½	3 8	45	·411		N E.
26	29·939	·051	72·7	20	2·2	52	·546		E.
27	29·755	·184	61 0	25	8·3	53	·720		S W.
28	29·855	·100	61·7	17	2·7	33	·428		(var.)
29	29·719	·136	83·5	24	3·5	47	·772		S W.
30	29·592	·127	85·3	18½	2·8	46	·725	0·075	S W.
31	29·685	·093	79·7	16	5·7	49	·533		WNW
Means	29·827	·094	79·2	17	3·7	50	·615	1·454	s38°w.

SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.

BEDFORD, Bedford Co. SAMUEL BROWN, Observer.

HUNTINGDON, Huntingdon County. JACOB MILLER, Obsr.

July, 1858.	Somerset Bar. Mean.	Somerset Ther. Mean.	Somerset Relative humidity. 2 P. M.	Somerset Force of vapor. 2 P.M.	Somerset Rain.	Somerset Prevail'g winds	Bedford Bar. Mean.	Bedford Ther. Mean.	Bedford Prevail'g winds.	Huntingdon Bar. Mean.	Huntingdon Ther. Mean	Huntingdon Rain.	Huntingdon Prevail'g winds.
	Inch.	°	Per ct.	Inch.	Inch.		Inch.	°		Inch.	°	Inch.	
1	27·650	78·3	62	·854		S E	29·063	78·7	(var.)	29·265	77·0		N E.
2	27·609	79·7	53	·781	0·143	W.	28·994	80·3	N W.	29·167	80 0	2·252	(var.)
3	27·565	79·7	63	·886	0·451	WSW.	28·936	83·7	N W.	29·107	82·0	0·424	(var.)
☽ 4	27·623	73·0	82	·785		(var.)				29·160	81·7		N W.
5	27·783	74·3	68	·788		(var.)	29·213	77·0	S E.	29·432	78·0		E.
6	27·872	73 0	60	·703		(var.)	29·318	73.7	S E.	29·528	74·7		S.
7	27·777	70·0	53	·622		S E.	29·199	70·3	S E.	29·404	72·7		S W.
8	27·646	70·7	42	·459		S E.	29·049	75·3	S E.	29 258	73·0		S.
9	27·654	78·0	65	·867	0·215	(var.)	29·044	80·0	S.	29·274	78·0	0·078	S.
● 10	27·725	75·3	59	·697		(var.)	29·148	82 3	N W.	29·323	81·3		W.
11	27·659	75·0	79	·859	0·394	W.				29 235	80·0	0·184	S.
12	27·527	70·3	86	·744	1·100	S W.	28·933	79·7	S E.	29·107	78·0	0·510	S.
13	27·657	65·3	80	·585	0·219	W.	29·059	70·0	N W.	29·273	70 7		W.
14	27·754	69·0	61	·587	0·151	W.	29 199	70·0	S W.	29·413	67·3	0·705	N.
15	27·782	70·0	65	·669	0·054	N.	29·199	72·7	N W.	29·401	73·3		E.
16	27·778	72·3	56	656		WNW	29·177	71·3	S E.				E.
☾ 17	27·773	76·3	53	·781	0·018	WSW.	29·158	78·0	S W.	29·358	78·3		S.
18	27·751	74·3	64	·774		N E.				29·382	76·7		E.
19	27·808	70·7	58	·573		S E.	29·256	72·7	(var.)	29·464	73·3		(var.)
20	27·652	72·0	63	·689	0·015	(var.)	29·123	71·0	S W.	29·292	70 7		S E.
21	27·556	70·7	67	·730		(var.)	28·916	74·0	N W.	29·092	75·3		W.
22	27·546	69·7	60	·540		WNW	28·922	73·0	N W.	29·122	71·3		(var.)
23	27·582	67·3	55	·560		W.	28·982	68·0	S W.	29·168	69·7		W.
24	27·626	68·0	50	·409		(var)	29·061	68·0	N W.	29·279	67·7		(var.)
○ 25	27 730	70·0	49	·557		S E.				29·394	69·3		S.
26	27·713	72·0	51	·635		S S E.	29·136	74·3	N W.	29 335	74·0		S.
27	27·685	74·3	47	·543		W.	29·085	77 3	S W.	29·266	79 3		(var)
28	27·731	72·0	51	·635		W.	29·156	77·0	N W.	29·352	76·7		N W.
29	27·652	77·3	50	·656	0·008	W.	29·017	82 0	(var.)	29·190	82·3		W.
30	27·566	73·3	70	·689	0·101	WNW	28·941	76·0	N W.	29·102	80 7	0·094	N.
31	27·592	71·0	70	·716	0·200	(var.)	28·995	72·7	N W.	29 184	76·0	0·453	N.
Means	27·678	72·7	61	·681	3·069					29·278	75·6	4·700	

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

NOVEMBER, 1858.

CIVIL ENGINEERING.

A few Remarks on Boiler Explosions and the Causes to which they are Attributed. By EDWARD STRONG.*

In the *Artizan* for the month of January I endeavored, in a few words, to bring before the notice of engineers the very unsatisfactory conclusions in many cases come to as to the causes of boiler explosions. Being aware that the views I hold on this subject were at variance with those held by many engineers, I felt it necessary at first to enter very cautiously on so important a subject; but having had my opinions on this point corroborated by an eminent engineer—Mr. Roberts, of Manchester—I may venture to enter more fully into this.

We may take it as granted, that it is the wish and duty of all engineers, when one of these unfortunate accidents occur, to use every means in their power to trace out the true cause of the accident; and when commencing such an inquiry, it should be thoroughly understood that in all these cases the accident must have arisen from either a defect in construction, or neglect of the owners or parties in charge of the boiler. And bearing this strictly in view, I cannot see but that a satisfactory result should be come to; and the defect or neglect ascertained would be the information engineers require to avoid and remedy for the future. Adopting this system, in preference to that of endeavoring to envelope the case in mystery, we might hope to look forward to boiler explosions being very rare, instead of every-day occurrences.

Under the head of "mysteries" may be classed two theories: the

* From the London Artizan, August, 1858.

first, the supposition of an explosion of hydrogen gas, from the decomposition of water, from the plates of the boiler having become overheated; the second, from the same cause (overheating of the plates), the water having taken the spheroidical form. It will be necessary to treat these two theories separately before entering into plain, practical facts.

The opinion, and which I have often heard expressed by engineers, is that the plates of a boiler (no distinction being made between those of iron and copper) having become heated to redness from shortness of water, a gas is generated as explosive as gunpowder. Now, it can only be said, that under such circumstances, hydrogen gas, one of the ingredients of an explosive mixture, becomes present in the boiler; but in this state it is harmless, as pure hydrogen will neither ignite nor explode, and only becomes dangerous when mixed with certain proportions of air or oxygen gas, neither of which should be present in boilers working. It is therefore evident that this theory rests only on suppositions, commencing at first in doubt as to whether the very fact of the plates being heated to redness, and thereby weakened, may not from this cause have given way and caused the explosion; and ending in doubt as to whether or not the hydrogen gas could have become explosive by an admixture of air, and how this air had become present in the boiler. The whole of this theory should be thrown aside, as at best it can only be shown to be the result of a prior defect, which defect is the one to be looked for, as had it not existed the boiler plates would not have become heated: it is the real cause of the accident. This cause can be easily traced to a practical fault, namely—either the entire want or improper condition of the lead plug.

But, although iron heated to redness has the property of decomposing water, it must be thoroughly understood that copper has not, as copper will not decompose water at any temperature; therefore where the boiler is constructed of this metal, or, as in the case of a locomotive, where the fire-box is of copper and the tubes of brass, the decomposition of water from these parts being heated is impossible, and the theory must not be allowed to be applicable to such a case. This I saw unintentionally corroborated in an article on the relative evaporating powers of iron and brass tubes, which appeared in *The American Railroad Journal*, from which I make the following short extract: "Iron absorbs heat so much more rapidly than copper that many explosions have occurred which would not had copper been used; although it is admitted, it is too bad to praise copper for this also, that it will not let a boiler blow up. Copper cannot be a good medium through which to raise steam and a bad one to blow up." Now, copper has been proved to be a good medium through which to raise steam, being superior in this respect to iron; and its being a bad one to blow up is from the very fact that it will not decompose water, when from a defect the metal has become heated.

Water in the Spheroidical Form.—The supposition that boiler explosions have been caused by the water in the boiler having taken this form arises from this. If a plate of iron is heated to the temperature

at which water boils, or to certain degrees beyond this, water being then thrown upon it, evaporates in the form of steam, but if the plate is heated considerably beyond this temperature, the result is different, as water then thrown upon it ceases to evaporate in the form of steam, and takes the spheroidical form, which is that of rolling on the surface of the heated metal in globular forms. If this water is allowed to remain on the metal until the temperature of it is gradually reduced to the point when water ceases to remain in the spheroidical form, it then rapidly evaporates in the form of steam. It is therefore said that the plates of a boiler may have become so much overheated as to cause the water in contact with it to take the spheroidical form, and that the heat of the plates has afterwards become reduced to the point where the spheroidical form of water ceases, and that then the evaporation of steam becomes so great that an explosion must ensue. It is mere supposition that an explosion should follow, never having been proved by an experiment, and there is every reason to believe such should not result from this, which I will endeavor to show.

Water is said to take the spheroidical form at a temperature of 340°. Allowing this to be correct, the ordinary working pressure of locomotive boilers is 120 lbs.: to raise steam to this pressure a temperature of 343° is required; therefore water at this pressure must be in the spheroidical form, and, according to this theory, whenever the pressure falls say to 110 lbs., the water ceases to be in the spheroidical form, and an explosion should follow; which, I need hardly say, in practice does not take place. But if there is any doubt in this case, we can go still further. Engines have been worked with perfect safety at a pressure of 200 lbs., requiring a temperature of 385°. I have seen the pressure of steam in these boilers gradually reduced to 100 lbs., without the least perceptible result beyond the reduction of pressure. The pressure of steam in a boiler has been raised to 300 lbs., and afterwards reduced, without the least sympton of an explosion. These are facts of themselves sufficient to prove, that attributing boiler explosions to water having been present in the spheroidical form, is an absurd thing.

Water in boilers which are not stationary, must frequently be in the spheroidical form, without any explosion resulting, as from their motion it occurs that a portion of the plate exposed to the fire is left for a time without a covering of water; this portion of the plate gets overheated, and on the position of the boiler being again altered the flow of water returns, and is brought in contact with the overheated plate. I have never known an explosion result from this, and yet I have frequently seen this occur—as, for instance, a locomotive ascending a very steep incline, and immediately afterwards descending a steep decline. I do not mean to say, that with proper care—keeping the water sufficiently high in the boiler—this would have been; but it is well known that drivers do often let the water fall rather too low, and that water in the spheroidical form must frequently be present in the boiler. But it is evident that water being present in a boiler in this form, can never of itself be the cause of an explosion; and such being found, the theory should no longer be allowed to be brought forward as a means of accounting for such accidents.

If these two theories may be allowed to be finally disposed of, the inquiry becomes a simple affair, as we have thus only to deal with mechanical defects, and these may be classed under three heads, which are, firstly, *insufficient strength of boiler* (from whatever cause this may have arisen, whether from weakness in original construction, or worn so from being long in use, or from a neglected leakage, or plates injured by action of fire, from either an accumulation of dirt in boilers or insufficiency of water); secondly, a *defective safety-valve;* and lastly, a *defective lead plug.* All boiler explosions may with certainty be said to be caused by one of these three defects.

Insufficient Strength of Boiler.—As regards the construction of boilers, no rule can be laid down as applicable to all cases—so much depends upon the pressure and quantity of steam required to be generated; but, as regards the form of boilers, one rule may safely be applied to all—that is, to adhere as closely as practicable to the circular form in all the parts. With the large flat surfaces, weakness may be said to commence, for however well these parts may apparently be stayed, they are in nearly all cases the weakest part of the boiler, and the most likely to become deranged—the strain on the stays is always more or less unequal. Where the pressure of steam is high, and the quantity required to be generated great, it is always safer to increase the number of the boilers, rather than to increase their dimensions beyond certain limits. Of the strength of boilers, engineers should not be satisfied by only having ascertained, by their calculations, that the boiler they have constructed is of amply sufficient strength for what is required of it, when it thus leaves their hands *new;* but they should satisfy themselves that there is an excess of strength sufficient to compensate for the wear of the plates during the number of years boilers are in general considered workable. But even allowing that the calculations in all points have been correctly made, this is not of itself sufficient to insure strength, as flaws may exist in the metal which the most practised eye cannot detect, making all calculations valueless. The only means to insure against these defects is, testing the strength of the boiler by hydraulic pressure to at least double the pressure it is intended to be worked at. But for this to be an effectual safeguard against explosions from weakness of boiler, it is necessary that this testing be renewed periodically—say annually—which can very easily be done. One of the most common causes from which boilers become weakened is a neglected leakage; it may often be seen how a plate originally $\frac{3}{8}$ths inch thick is rapidly reduced to $\frac{1}{8}$th inch, by the corroding action of the water escaping from the faulty part. A leaky boiler may also be said to be an encouragement to the party in charge of it to allow an accumulation of dirt in the inside of it, as he finds the leakage less troublesome when the boiler is in this state, and thus the injury to the boiler increases, as where the dirt is, the water cannot be in contact with the plate, and then the action of the fire upon it is very injurious. This also greatly affects the steaming powers of the boiler, the dirt always being a bad conductor of heat. The parties in charge of boilers should be made to understand the great danger which ensues from a

leakage, however small, being allowed to continue, and also the necessity of keeping the plates of the boiler as clean as possible.

Defective Safety-valve.—It is absolutely necessary that every boiler should be fitted with a safety-valve; on no account should one safety-valve be allowed to act for two boilers, or, as is sometimes the case, for four or five; in all these cases each boiler is fitted with a stop-cock, which has the power of closing all communication between the boiler and safety-valve. It is therefore possible that, either from accident or neglect, this cock may be closed in one of the boilers in which steam is being generated: an explosion would then be inevitable. The danger of this system of construction is so plain to every one, that it may be supposed to be sufficient for its own remedy; yet it is not so, as this system is extensively in use; and what appears still more strange is, that even in the Government service it is adopted, or, perhaps more properly speaking, allowed. On the necessity of every boiler having a separate safety-valve, I would go still further, and say, each should be fitted with two, as in a locomotive. It is possible that one valve may become locked, but it is almost impossible that two can be so at the same time. I will not attempt to give an opinion as to which is the best arrangement of safety-valve to adopt, there are so many different plans, but those which are the most simple should be preferred, being less liable to become deranged. Explosions are frequently caused by safety-valves having become locked through a defect; these defects are various, although all leading to the same results. What would assist in preventing this would be making all the working joints of brass, which would not thus become corroded by the action of the steam. At present, the lever and working joints are of iron; they become so corroded by the continued action of the steam, that considerable force is often required to work them. It may be said that a brass lever would not be of sufficient strength, but this objection might be avoided by allowing the lever still to be of iron, and at the working joints to face and bush it with brass.

Safety-valves often become locked, although in perfect working order themselves, from a defective arrangement of the spring balance; this is an error which is unfortunately very common. If we take an ordinary spring balance, constructed, say to work at a pressure up to 120 pounds, in screwing it down to this pressure it will be seen that the index finger is brought within $\frac{1}{8}$th of an inch of the guard at bottom of balance; this, with the ordinary arrangement of lever, gives only $\frac{1}{40}$th of an inch for the valve to rise; and even this is not its most dangerous feature, as if the connecting rod to which the balance is attached is not adjusted with the greatest exactitude, but left $\frac{1}{8}$th of an inch too short, on the nut of balance being screwed home the index finger rests on the guard of balance; thus the safety-valve becomes effectually locked. I have known lives lost from an explosion which I could only attribute to this, which might be thought trifling defect. The index finger should always be at least one inch clear of the bottom guard of balance, after the nut is screwed home.

One of the safety-valves of a boiler should always be within easy

reach of the person in charge, so that he may frequently try if the valve is working freely.

Defective Lead Plug.—To this cause should be attributed all boiler explosions from overheated plates. The safety of the boiler depends as much upon the lead plug being in proper condition, as upon the state of the safety-valve. Men may neglect their duty and allow the water to fall too low, but when the boiler is fitted with a proper lead plug, the most serious result which can follow this neglect is the fire being extinguished. A lead plug to be in proper condition should be renewed monthly, and of sufficient size, not less than one inch; where they are thus used, the overheating of a boiler from scarcity of water is a matter of impossibility. But notwithstanding this, the lead plug has got into disrepute, not from any defect of its own, but from neglect or ignorance of those whose duty it should have been to have seen it kept in proper condition. The result of this is, that a nnmber of boilers are now not fitted with lead plugs, or else where they are fitted in at first, they are afterwards so much neglected as to be perfectly useless when their safe action is required. The proper use of the lead plug should be insisted upon as one of the greatest means of safety.

The means to be adopted for preventing boiler explosions may be summed up in these few words: the strength of the boiler to be annually tested by hydraulic pressure to double its working pressure; a leakage, however small, to be at once stopped; the boiler kept clean; the boiler to be fitted with two safety-valves, and a led plug kept in proper condition. Where these directions are strictly attended to, a boiler explosion may be said to be an impossibility.

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*On the Navigation of Canals by Screw Steamers.**

By Neil Robson, C. E.

Paper read at the Institution of Engineers in Scotland.

It is not the object of this paper to go into any lengthened history of the various modes of haulage that have been tried on canals in general, but rather to collect and make known to the members of the Institution some facts connected with recent successful attempts to introduce screw propulsion on the Forth and Clyde Canal, with which the author is best acquainted, and which, as is well-known, is one of that principal arteries of inland navigation in Scotland. And by so doing, to direct the minds of the ingenious mechanical engineers of which the society is composed to the great importance of the subject, and to elicit opinions as to its farther development, with a view to improve the mechanical details and arrangements of the power employed.

But whilst this is the chief object of the author in bringing the subject before the Institution, he will venture to digress so far as to introduce a few preliminary observations on inland navigation in general, and will briefly notice a few of the English canals on which this new mode of haulage has been tried and is now in use. The several experi-

* From the London Civ. Eng. and Arch Jour., Septmber, 1858.

mental attempts which have been made to introduce other modes of haulage on the Forth and Clyde Canal will then be given somewhat in detail, and the paper will be brought to a close by a description of the system now being introduced on that canal; reference being made to drawings illustrative of the boat *Thomas* and her engine, with which the first really successful experiment was made, under the canal company's more immediate control, with the advice and under the superintendence of their officers. In the concluding remarks the author will contrast the expense of horse and steam haulage, as brought out by the results so far as they have gone.

It cannot be denied that since the introduction of railways, canals, which prior to that event formed the principal mode of conveyance for a very large proportion of the goods and mineral traffic of the country, have been thrown into the shade; and that the attention of practical men has been more devoted to the development of railway traffic, not only as regards the mechanical appliances for its transit, but also as regards the acquisition and carrying of large quantities of merchandise and minerals, than to the improvement of the more ancient mode of conveyance.

There is no good reason however why this should be so; for although in some cases canals may be the avowed rivals of railways, in others, they are or might be made the means of feeding their traffic, or of relieving them of a portion of the heavy merchandise and mineral traffic which railways cannot always carry with advantage to themselves. It does not follow that because a railway may be carrying a large amount of tonnage it is doing so profitably; on the contrary, it is to be feared that in many cases, if the cost were fairly set against revenue, the result would be found quite the reverse; the rates obtained being inadequate to meet the greater wear and tear of the iron road, as compared with the water-way, and the many sources of expense to which railway plant is subjected. For passengers and for light and perishable goods, and for goods requiring quick despatch, canals never can or ought to compete with railways; but for bulky and heavy goods and minerals, the author is convinced that they can and will maintain their ground, provided their managers keep pace with the improvements and requirements of the day.

In Great Britain and Ireland, the total length of canal and inland navigation is about 4000 miles; and it is estimated there has been expended in the construction and improvement thereof at least £50,000,000 sterling. These figures of themselves sufficiently demonstrate the importance, in a national point of view, of this great interest.

For the most part, canals carry on toll; that is to say, they are open to any trader, however small, who chooses to send his own boat with horses to tow it, on payment of the fixed rate of toll; and in this respect they are similar to turnpike roads. In a few instances canal companies act as carriers on their own account, but it is questionable how far they do wisely in this. It consists with the author's knowledge that the Forth and Clyde Company, who ceased altogether to be carriers about five years ago, except to a very small extent, have made more

money by falling back on their simple province of keeping the canal in repair, and acting as recipients of toll.

It appears that the first attempt to propel boats by the screw on the English canals was made about twenty years ago between London and Manchester; but from the number of locks, there being about one to every mile, and from the narrowness and want of depth of the canals which compose that route, it was not so successful as to lead to any practical result at the time. Within the last three or four years, navigation by screw boats has been introduced on the Aire and Calder navigation, on the Leeds and Liverpool Canal, and on several others in that country; and so far with success. The best practical results as regards speed and economy of working is obtained on those canals of which the depth is not less than 6 feet; breadth at water level 50 feet, and at bottom about 35 feet; but as the majority are of less size, it is to be hoped that the time will come when screw propulsion may be applied with advantage on our shallowest and narrowest canals; and to that end, the bringing of the subject to the notice of such meetings as this will no doubt tend.

The first attempt to move a vessel by steam on the Forth and Clyde Canal was made about the beginning of the present century, and it appears that Mr. Symington was connected with the fitting up of the boat. This boat was propelled by two paddle wheels close together at the stern, with the driving cranks between them. It ran for some little time; but its chief merit was considered to lie in its being an ice breaker, for which it answered admirably. Although the records of the canal do not mention the fact, there can be little doubt that this was the *Charlotte Dundas*, constructed by Symington in 1802, and with which he made one of his first essays in steam navigation.

In 1828, the *Cyclops*, a boat for carrying passengers, was fitted up as a steamer with paddle-wheels at the stern. She was 64 feet long, 16 feet broad, and 6 feet deep; carried about 40 tons of goods, and went about $3\frac{1}{2}$ miles per hour on the canal, and about 6 miles on the Firth of Forth.

In 1831, the *Manchester* steamer was built, propelled likewise by one wheel at the stern. She carried from 50 to 60 tons of goods, and steamed about $4\frac{1}{2}$ miles on the canal, and 7 miles on the Firth.

The *Lord Dundas* was also built in 1831 as a passenger boat. She had two paddle-wheels, one on each side of the stern, and steamed about $7\frac{1}{2}$ miles an hour on the canal.

All these boats ceased to be used on account of the cost of working being greater than horse haulage, and from constant failures in the machinery.

It was proposed at one time, and actually tried, to haul vessels on the canal by laying a chain along the bottom, to be acted upon by a pulley in the boat; the pulley being worked either by hand or steam power.

Another experiment was the laying down a line of railway on the towing path, on which a locomotive engine ran and hauled boats behind her; a previous trial for hauling them by a locomotive for common

roads running on the towing path having signally failed, as might reasonably have been expected.

In 1844, a Mr. Kibble patented a paddle-wheel composed of a number of float-boards fastened on an endless chain working round two drums. It was thought that this mode of propulsion was well adapted for canals, and a boat fitted with a paddle of this description on each side was tried, but given up on account of the expense.

The late Mr. Smith of Deanston had a plan which he intended for the small canals in the West Indian Islands, of having a wheel passing through and projecting below the bottom of the boat, so as to run on the bottom of the canal and thus haul the boat. This plan was tried on a reach of this canal about ten years ago, but did not answer.

In addition to these, the author understands that several attempts were made to introduce steam on the Union and Monkland Canals, which communicate with the Forth and Clyde Canal, but are of less depth and width. In 1846, a steamer with double screws was tried on the Union. In 1845, a steam-tug built by Mr. Wm. Napier, Jr., was tried on the Monkland Canal.

From some cause or other it appears that all these attempts, not only on the Forth and Clyde but on other canals running into it, were more or less failures; and that it is only within the last two years that anything like a systematic carrying out of steam propulsion has been accomplished. The available depth of water on this canal is about 8 ft. 6 ins.; average width at water surface 60 feet; and at bottom from 30 to 40 feet. Its length is 39 miles, and there are 40 locks, the dimensions of which are—length, 70 feet; width, 20 feet; and least depth on sill, 9 ft. 4 ins. The Monkland Canal, now amalgamated with it, is 12 miles long, but its available depth is only about half that of the Forth and Clyde; width at water surface, 40 to 50 feet; and at bottom, 25 to 30 feet; length of lock, 70 feet; width, 13 ft. 6 ins. The total merchandise and minerals conveyed on the main canal and its Monkland branch, is upwards of two millions of tons per annum.

At present there are five screw steamers, belonging to different traders, daily at work on the main line, and one belonging to the canal company, who are also fitting up another with screw machinery to serve as an ice-breaker, and have drawings in progress for engines to be fitted to a canal and sea-going steamer.

The lighter *Thomas*, to which this paper more particularly refers, was not originally built for being fitted with the screw, nor is she of a class adapted for going out into the Firth, but nevertheless she may be taken as a fair sample of a large class of lighters in use on the canal. She is 66 feet long; 16½ feet broad; draws about 6½ feet of water; and carries from 70 to 80 tons of cargo. The screw lighters belonging to the traders are larger, and are fitted to navigate the Firths of Clyde and Forth as well as the canal, and to carry from 100 to 120 tons of cargo.

The engine and boiler of the *Thomas* are placed in the stern, behind the bulkhead, which partitions off the stern portion to the same extent as the stern portion of the other lighters of the class which is used

for horse haulage; and this space, small though it is, is found amply sufficient for the boiler, engine, and coal bunker, with room for attending the engine and stoking the boiler. The weight of the engine, boiler, and propeller, including 13 cwt. of water, does not exceed 3 tons. The dimensions of the boiler and engine are as follows, viz:—

Inside diameter of body of boiler, 3 feet; and swelled to 3 feet 5 inches at surface water line. Height of boiler from fire-bars to crown, 7 feet 3 inches. The boiler is furnished with 54 brass tubes of the average length of 3 feet 5 inches; and tapered from 2¼ inches diameter inside at the fire-box tube plate, to 1¾ inches inside diameter at the uptake tube plate; which give the heating surface in fire-box and tubes as follows, viz:—

	Square feet.
Fire-box, 2 feet 6 inches by 1 foot 6 inches, . .	11·78
" tube plate, . . .	2·54
Total fire-box surface, . .	14·32
54 tubes 3 feet 5 inches long and 2 inches average diameter,	96·60
Total heating surface, . .	110·92

	Ft.	ins.
Diameter of cylinders, . . .	0	6¼
Stroke of piston, . . .	0	10
Valves worked by link motion, extreme throw, . .	0	3
Diameter of screw propeller, . .	3	6
Pitch of screw, ...	4	0

The engine cylinders are bolted together, forming the steam chest between them, in the usual way. The cylinders lie on the bilge of the lighter, and their connecting rods are attached directly to cranks at right angles to each other on the engine shaft, which is coupled to the propeller shaft. The screw of 4 feet pitch at 130 revolutions per minute gives a speed of five miles an hour, while the advance of the screw due to the speed is 5·909 miles per hour, showing a slip of the screw of $\frac{2}{13}$ths.

It is found that 35 lbs. per square inch of pressure in the cylinders is sufficient for propelling the lighter with a full cargo of from 70 to 80 tons. In breaking through the ice on the canal in December, 1856, the boiler was worked up to 85 lbs. pressure, and at that pressure the boiler was more than capable of supplying the cylinders with steam. The contracted area of the water surface gave rise to a suspicion that the boiler might be liable to prime, and after some experiments with a glass model boiler, it was resolved to fit in a current plate round the inside of the boiler shell. Without estimating the merits of the current plate, it may be stated that the boiler is quite free from priming with the steam taken from the crown with a 1½ inch pipe. The taper tubes were deemed a desideratum, with the view of obtaining an increased influence from the fire throughout the short distance it has to pass from the furnace to the uptake, and also to allow the upper tube plate to be reduced in diameter, thereby increasing the surface of the water in the boiler.

On a late trial of four trips from Port Dundas to Bowling (a distance

of 12 miles) and back, making a distance of 96 miles run, passing through 144 canal locks, and getting up steam 8 times, the consumption of coal (good Monkland soft coal) was 1 ton 3 cwt.; which at average length of runs on the Forth and Clyde Canal might be stated to be equal to 100 miles steaming by one ton of coals.

As the engines were fitted to the lighter as an experiment, it was deemed desirable to make them of sufficient power to tow another lighter of similar size, which they were quite able to do: but the traffic the lighter is at present employed in does not afford opportunities for using the surplus power in towing an additional boat.

The boiler has been proved to be so capable of raising steam, that the canal company have contracted for two similar boilers with iron tubes, to supply steam to two $9\frac{1}{2}$ inch cylinders with 15 inch stroke of piston. These are to be fitted to an ice-breaker, which is also used for the surface of the canal works.

The lighter has been constantly at work for the last fifteen months between Port Dundas and Bowling, a distance of 12 miles, carrying general merchandise in connexion with the Dumbartonshire Railway, and without losing a single trip through any accident, injury, or repair of the machinery. The only alteration made in the machinery was the substitution of cast iron valves for brass valves, and the only mishap which has befallen any part of the working gear was the breaking of one of the arms of the screw propeller. She can easily make three trips a week, and usually performs the voyage each way in four hours, when not detained at the locks by the passing trade; which, including the detention in passing through the eighteen locks, is at the rate of 3 miles an hour, but when fairly clear of the locks her average speed is 5 miles per hour.

There is very little additional swell or washing of the banks at this speed, and on the whole there does not appear to be any appreciably greater wear and tear of the canal than that arising from the passage of boats drawn by horses,—at all events, no more than would be compensated for by the saving in upkeep of the banks, in having no towing path to uphold were horse haulage done away with.

Altogether the result proves that by means of the screw the navigation of canals by steam is perfectly practicable. But it is still doubtful how far this power can be applied to propel, with advantage, more than the boat in which the engine is placed, owing to the difficulty of steering boats towed behind, especially in narrow canals; and to the circumstance that when the tug with its train of boats approached a lock, each would have to be disconnected and taken through singly. The author inclines to the belief that, as a general rule, an engine must be put in each boat. That this can be done with advantage with boats for goods, he thinks he has proved; but the problem has still to be solved, whether the system can be profitably applied to boats carrying minerals alone on such canals as the Monkland, of which the available depth is only $4\frac{1}{2}$ feet, and the width proportionably small. These boats, or "scows" as they are termed, carry on an average 55 tons; are in length 66 feet, width 13 feet 4 inches; cost, built of iron,

about £250; and are usually hauled by one horse. The speed when loaded is about 2 miles an hour clear of the locks, and going back empty it is a little more.

It is obvious that if every such coal boat must have an engine for itself three things will be required. 1. The machinery must occupy little room, in order to leave space for the cargo. 2. The first cost must be small. 3. Its working must be economical, both as regards repairs and consumption of fuel. The author does not despair of seeing all these accomplished, and hopes that the time is not far distant when the haulage even of coal scows will be done more cheaply than by horses.

Meantime he wishes it to be understood that the following comparison of the cost of the two systems applies exclusively to the results obtained from the experiments with the *Thomas*, running to and from Bowling with goods, and being somewhat in favor of steam, may be accepted as a good omen that better results will yet be obtained. For although this portion of the canal is favorably adapted for steaming, so far as depth and width are concerned, yet, owing to the great number of locks, and detention there, it is in other respects less favorably adapted than other portions, where the reaches are longer and the locks fewer.

Comparison of Cost of Horse and Steam Haulage. Horse Haulage to and from Bowling. Goods Lighter.

	£	s.	d.
One master, per week,	£1	1	0
One mate "	0	18	0
One horse and one man tracking, and making two trips per week,	1	8	0
Ropes for tracking,	0	2	0
	3	9	0
Add interest on cost of lighter, £450, at 5 per cent., and for repairs and depreciation 7½ per cent. on same amount, per week,	1	1	7½
Total per week,	£4	10	7½

Thus at two trips per week, £4 10*s.* 7½*d.* divided by 48 miles gives 1*s.* 10½*d.* as the cost per mile per boat load of 75 tons, or $\frac{3}{10}$ths of a penny per ton per mile.

The same with steam.

	£	s.	d.
One master, per week,	£1	1	0
One mate "	0	18	0
One engine-driver	1	0	0
Oil, tallow, and gasket, per week,	0	3	8
15¾ cwt. of coals per week,	0	5	6¼
	3	8	2¼
Add interest on cost of lighter, £450, engine £320, together, £770, at 5 per cent., and 7½ per cent. on the same sum for repairs and depreciation,	1	17	0¼
Total per week,	£5	5	2½

Thus at three trips per week, £5 5*s.* 2½*d.* divided by 72 miles gives

1*s.* 5½*d.* as the cost per mile per boat load of 75 tons, or $\frac{23}{100}$ths of a penny per ton per mile.

From the slow rate of trackage by horses, no more than two trips per week are got, while with steam three trips are easily made; and hence arises a very considerable part of the above saving in favor of steam power.

From these figures it appears that the cost by steam haulage is at the rate of 17·5 pence per boat load per mile, or $\frac{23}{100}$ths of a penny per ton per mile; and by horse haulage, 22·5 pence per boat load per mile, or $\frac{3}{10}$ths of a penny per ton per mile; including in either case an allowance for tear and wear, and repairs, and interest on the price of the boat, and the same on the machinery in the case of steam. These rates are calculated on the supposition that the full load of 75 tons is carried both ways, but as that will not always be so in practice, the cost will generally be somewhat higher, whether by steam or horse haulage. And when the boat is only loaded in one direction and comes back empty, the cost will of course be still higher.

In the discussion which followed, it was remarked by Mr. Robson that the paper showed how the navigation of canals by steam had been effected at a less cost than by horse haulage in one particular instance. It would be observed, that in the *Thomas*, with which this result had been obtained, the engine and boiler were put into a very small space at the stern. If, however, steam power was to be rendered applicable to canals of very small depth, like the Monkland, the engine and boiler would have to be squeezed into a still smaller space. He confidently expected this would be done, and it was one of the objects of his paper to bring this point before the Institution, in the hope of eliciting a suitable plan from some of the ingenious mechanical engineers amongst its members. If the system was to be applied to coal scows, it was necessary that the engine, boiler, and propeller should not cost more than £150.

Mr. Milne, the engineer and superintendent of the Forth and Clyde Canal, stated, that at the low speed of five miles per hour of the *Thomas*, no appreciable wave was raised in the canal. If that speed was exceeded, a wave would rise; but at a speed of five miles and under, the canal banks were unaffected. That speed was quite sufficient for all the purposes of the traffic. The engine of the *Thomas* was sufficiently powerful to carry a much larger cargo than the present boat was capable of taking. He thought the efficiency of the boiler arose in some measure from the use of the tapered tubes. He had had considerable difficulty in getting such tubes; but he had recently succeeded in obtaining tapered iron tubes, a specimen of which he exhibited, and he intended to use them in future. The heating surface in the *Thomas's* boiler was 1·8 foot per superficial inch of piston, whilst in a number of locomotives with which he was acquainted it was on an average 2·8 ft.

It was asked if the different traders could be got to bring their boats punctually at the time appointed for starting the trains? Mr. Milne

thought that this was one of the great difficulties connected with trains of boats; several traders could never be depended on to have their boats ready at the proper times. But the greatest difficulty with trains would be at the locks; the boats would have to be detached and passed through one at a time, and when boats were passing in the opposite direction, further delay would be caused; as if the going boats claimed the lock each time it was full, the returning boats would claim it each time it was empty.

It was remarked that, in the comparison given in the paper between steam and horse haulage, the latter had been put down at $\frac{3}{10}d.$ per ton per mile. In the case of minerals, the cost of horse haulage was, in many cases, not more than $\frac{1}{8}d.$ per ton per mile.

Mr. Milne stated, that in the case from which the data for comparison were derived, there were only two-thirds of the mileage that was generally got with minerals. There were three locks every two miles on the canal between Port Dundas and Bowling; whilst on the mineral canals where the horse haulage was so low, the number of locks was much less; besides, the coal scows met with much less detention, when loading and unloading, than boats carrying a general goods cargo.

Mr. Robson said he was aware of instances where the cost of horse haulage was as low as $\frac{1}{8}d.$ per ton per mile. In one set of figures he had seen it $\frac{1}{6}d.$ per ton per mile, and he had thought it would be difficult to do it more cheaply. However, he had seen reason to alter this opinion. In horse haulage, the number of trips was limited, whilst with steam, one-third more trips could be got with a boat.

Mr. Milne was satisfied that with steam they would be able to carry at two-thirds of the cost of horse haulage, under any circumstances. Horses could not last beyond a certain time, whilst with $7\frac{1}{2}$ ℔ cent. set aside for repairs, the duration of an engine might be said to be unlimited.

Prof. Rankine observed, that Mr. Robson's paper was a most important one. Canals were the best means of conveyance for heavy goods of small value for their weight, at low speeds, on account of the small propelling power required, and the consequent small cost. They had been neglected of late years, but undeservedly so, and it was gratifying to see them again attracting attention. Steam power had been found advantageous in every other application, and he thought it would eventually prove so in this. As mentioned in the paper, many schemes had been tried; amongst others was that of warping, by means of a chain lying along the bottom of the canal. He believed this plan had been used with advantage in tunnels where there was no towing-path; but he thought it must be expensive. He thought it a pity that some other ingenious projects that had been formed had not been tried. There was one in particular, invented by Mr. Charles Liddell, in which fixed engines and wire ropes were to be used, and which would probably give very good results, if the traffic was sufficiently great to keep the apparatus continually at work. The case of the *Thomas*, detailed in the paper, was one of the first, if not the only instance, in which steam power had been applied with practical economy.

*Duty of Steam Engines.**

The following interesting practical examples of the difference between the actual and the theoretic duty in different descriptions of engines is extracted from an admirable paper by Prof. Thomson on the dynamic theory of steam, published in the Edinburgh Philosophical Transactions of 1850, 1851:

"1. The engine of the Fowey Consols mine was reported in 1845 to have given 125,089,000 foot-pounds of effect for the consumption of one bushel or 94 lbs. of coal. Now the average amount evaporated from Cornish boilers by 1 lb. of coal is $8\frac{1}{2}$ lbs. of steam; and hence for each pound of steam evaporated 156,556 foot-pounds of pressure are produced.

"The pressure of the saturated steam in the boiler may be taken as $3\frac{1}{2}$ atmospheres, and consequently the temperature of water will be 150°. Now by Regnault (end of Memoire x,) the latent heat of a pound of saturated steam at 140° Cent. is 508, and since, to compensate for each pound of steam removed from the boiler in the working of an engine, a pound of water at the temperature of the condenser (which may be estimated at 30°) is introduced from the hot well; it follows that 618 units of heat Cent. are introduced to the boiler for each pound of water evaporated. But the work produced for each pound of water evaporated was found above to be 156,556 foot-pounds; hence, $\frac{156,556}{618}$, or 25·3 foot-pounds is the amount of work produced for each unit of heat transmitted through the Fowey Consols engine.

"2. The best duty on record as performed by an engine at work (not for merely experimental purposes) is that of Taylor's engine at the United Mines, which in 1840 worked regularly for several months at the rate of 98,000,000 foot-pounds for each bushel of coal burned; this is $\frac{98}{125}$ or ·784 of the experimental duty reported in the case of the Fowey Consols engine.

"Hence, the best useful work on record is at the rate of 198·3 foot-pounds for each unit of heat transmitted, and is $\frac{198 \cdot 3}{440}$, or 45 ℔ cent. of the theoretical duty, on the supposition that the boiler is at 140° and the condenser at 30°.

"3. French engineers contract (in Lille, in 1847, for example,) to make engines for mill power which will produce 30,000 metre-pounds or 98,427 foot-pounds of work for each pound of steam used. If we divide this by 618, we find 159 foot-pounds for the work produced by each unit of heat. This is 36·1 ℔ cent. of 440, the theoretical duty.

"4. English engineers have contracted to make engines and boilers which will require only $3\frac{1}{2}$ lbs. of the best coal per horse power per

* From the Lond. Civ. Eng. and Arch. Journ., Sept., 1858.

hour. Hence, in such engines, each pound of coal ought to produce 565,700 foot-pounds of work, and if 7 lbs. of water be evaporated by each pound of coal, there would result 80,814 foot-pounds of work for each pound of water evaporated. If the pressure in the boiler be $3\frac{1}{2}$ atmospheres (temperature 140°), the amount of work for each unit of heat will be found, by dividing this by 618, to be 130·7 foot-pounds, which is $\frac{130 \cdot 7}{440}$ or 29·7 ℔ cent. of the theoretical duty.

"5. The actual average of work performed by good Cornish engines and boilers is 55,000,000 foot-pounds for each bushel of coal, or less than half the experimental performance of the Fowey Consols engine, and scarcely more than half the actual duty performed by the United Mines engine in 1840; in fact, about 25 ℔ cent. of the theoretical duty.

"6. The average performance of a number of Lancashire engines and boilers have been recently found to be such as to require 12 lbs. of Lancashire coal per horse power per hour (*i. e.*, for performing $60 \times 33{,}000$ foot-pounds), and a number of Glasgow engines such as to require 15 lbs. (of a somewhat inferior coal) for the same effect. There are, however, more than twenty large engines in Glasgow at present, which work with a consumption of $6\frac{1}{2}$ lbs. of dross, equivalent to 5 lbs. of the best Scotch or 4 lbs. of the best Welsh coal, per horse power per hour. The economy must be estimated from these data, as in the other cases, on the assumption, which with reference to these is the most probable we can make, that the evaporation produced by a pound of best coal is 7 lbs. of steam.

"The following tables afford a synoptic view of the performances and theoretical duties in the various cases discussed above.

"In table A the numbers in the second column are found by dividing the numbers in the first by $8\frac{1}{2}$, in Cases 1, 2, and 5; and by 7 in Cases 4, 6, and 7, the estimated numbers of pounds of steam actually produced in the boilers by the burning of one pound of coal.

"The numbers in the third column are found from those in the second by dividing by 618 in Table A, and 614 in Table B, which are respectively the quantities of heat required to convert a pound of water taken from the hot-well at 30° into saturated steam in the boiler at 140° or at 121°.

"With reference to the Cases 3, 4, 6, 7, the hypothesis of Table B is probably in general nearer the truth than that of Table A. In 4, 6, 7, especially upon hypothesis B, there is much uncertainty as to the amount of evaporation that will be actually produced by one pound of fuel. The assumption on which the numbers in the second column in Table B are calculated is, that each pound of coal will send the same number of units of heat into the boiler, whether hypothesis A or hypothesis B be followed. Hence, except in the case of the French contract—in which the evaporation, not the fuel, is specified—the numbers in the third column are the same as those in the third column of Table A.

TABLE A.—*Various Engines in which the Temperature of the Boiler is* 140° *Centigrade, and that of the Condenser* 30° *Centigrade.**

Theoretical duty for each unit of heat transmitted, 440 foot-pounds.

CASES.	Work produced for each pound of coal consumed.	Work produced for each pound of water evaporated.	Work produced for each unit of heat transmitted.	Percentage of theoretical duty.
	Foot-pounds.	Foot-pounds.	Foot-pounds.	
1. Fowey Consols experiment, reported in 1845, ...	1,330,734	156,556	253·0	57·5
2. Taylor's engine, at the United Mines, working in 1840, . .	1,042,553	122,653	198·4	45·1
3. French engines, according to contract, ...	—	98,427	159·0	36·1
4. English engines, according to contract, . . .	565,700	80,814	130·8	29·7
5. Average actual performance of Cornish engines, . . .	585,106	68,836	111·3	25·3
6. Common engines, consuming 12 lbs. of best coal per hour per horse power, . . .	165,000	23,571	38·1	8·6
7. Improved engines with expansion cylinders, consuming an equivalent to 4 lbs. of best coal per horse power per hour, . . .	495,000	70,710	114·4	26·0

TABLE B.—*Various Engines in which the Temperature of the Boiler is* 121°,† *and that of the Condenser* 30°.

Theoretical duty for each unit of heat transmitted, 371 foot-pounds.

CASES.	Work produced for each pound of coal consumed.	Work produced for each pound of water evaporated.	Work produced for each unit of heat transmitted.	Percentage of theoretical duty.
	Foot-pounds.	Foot-pounds.	Foot-pounds.	
3. French engines, according to contract, . . .	—	98,427	160·3	43·2
4. English engines, according to contract, . . .	565,700	$\frac{614}{618}\times 80{,}814$	130·8	35·0
6. Common engines, consuming 12 lbs. of coal per horse power per hour,	165,000	$\frac{614}{618}\times 23{,}571$	38·1	10·3
7. Improved engines, with expansion cylinders, consuming an equivalent to 4 lbs. of best coal per horse power per hour, . . .	495,000	$\frac{614}{618}\times 70{,}710$	114·4	30·7

* 1° Centigrade 1·8° Fahrenheit.

† Pressure 15 lbs. on the square inch.

In the following estimate of the theoretical duty of engines worked with initial pressures of 150 and 90 lbs. respectively, and cutting off at $\frac{1}{10}$ and $\frac{1}{6}$ the stroke respectively, Mr. Prideaux has taken into account the increment of effect due to the infiltration of the expanding steam with heat from the steam-jacket, and compared the estimated theoretical duty with the actual performance of the best Cornish and marine engines.

	lbs.
"Steam of 150 lbs. cut off at 1-10th will exert a mean pressure of .	49·50
Allow 10 per cent. for increase in elasticity, from steam becoming sub-saturated, with 46° surplus heat, and a tension of 18·5 lbs. at the end of the stroke, ...	4·95
Vacuum, ...	12·00
Total, . . .	66·45

lbs. lbs.
66·45 × 144 = 9568·8 raised 1 foot, by one cubic foot of atmospheric steam + 46° of heat.

lbs. vol. of steam.
9568·8 × 1669 = 15,970,327 raised 1 foot, by the conversion of 1 cubic foot of water into steam of 150 lbs. = the addition to one cubic foot of water at 100° of 1078·8 + 46° of heat.

	lbs.
Steam of 90 lbs. cut off at 1-6th will exert a mean pressure of	42·0
Allow 10 per cent. for increasad elasticity, from steam becoming sub-saturated, with 34° surplus heat, and a tension of 18 lbs. at end of stroke, ...	4·2
Vacuum, ...	12·0
Total, . . .	58·2

lbs.
58·2 × 144 = 8380·8 raised 1 foot by one cubic foot of atmospheric steam + 34° of heat.

8380·8 × 1669 = 13,987,552 raised 1 foot by the conversion of 1 cubic foot of water into steam of 90 lbs. = the addition to 1 cubic foot of water at 100° of 1078·8° + 34° of heat.

A cubic foot of water weighs 62·32 lbs.; allowing 5 lbs. of coal to evaporate this quantity (= 12·464 lbs. per pound of coal—and 12·9 has been done), we get as the theoretical duty of one pound of coal:

	lbs.		lbs. of coal. per H. P. per hour.	Per centage of duty.
In the engine with initial pressure of 150 lbs. and cutting off at 1-10th,	3,194,065	raised one foot =	·62	100·00
In engine with initial pressure of 90 lbs. and cutting off at 1-6th,	2,797,511	"	·70	87·58
Utmost duty known to have been performed by a Cornish engine,	1,329,787	"	1·48	41·63
Common amount of duty for a superior Cornish engine, .	1,000,000	"	1·98	31·30
Average duty of Cornish engines,	750,000	"	2·64	23·48
" best marine "	450,000	"	4·4	14·09"

It has been already said that the best expansive engines have never realized in practice more than 60 ℔ cent. of their theoretical duty. As regards the *composition* of such loss of 40 ℔ cent. Mr. Pole found, that if an engine of that kind expanding $3\frac{1}{2}$ times were absolutely perfect,

each unit of heat given out by the combustion of the fuel ought to develope about 134 units of work; but the amount actually produced in the shape of water raised was only about 80 units, or 60 ℘ cent. less than the theoretical result. He had endeavored to discover at what parts of the engine this loss occurred, and had found it might be distributed about as follows:

Imperfect combustion and other causes of waste of heat in the boiler,	$12\frac{1}{2}$
Heat expended in raising the temperature of the feed water to a boiling point, ...	$12\frac{1}{2}$
Friction, imperfect vacuum, air pump, &c., or power wasted in working the engine, ...	15
	40
Useful effect realized, . . .	60
Total calorific power of the engine, .	100

The friction of the machinery of a locomotive engine has been experimentally determined by De Pambour at $\frac{1}{11}$ of the tractive force it exerts, and this exactly coincides with the results of Mr. Pole's analytical investigation of the friction of the direct-acting marine engine with slides. This is of course exclusive of the resistance of the air-pump, and of the friction caused by the pressure (when unbalanced) of the steam on the back of the slide valve.

For the Journal of the Franklin Institute.

The Barometer as an Engineering Instrument.

By John M. Richardson, B. S.

One of the first duties of an engineer after taking charge of any proposed line of railway, plank road, or canal, is to make himself thoroughly acquainted with the physical features of the country between the termini of the same. He should know every forest and cultivated field, every mountain and plain, every river and rivulet, every valley and every range of hills. All these should be as indelibly engraved upon his mind as upon a map. Indeed, he should be as familiar with every feature of the country over or through which the improvement is to run, "*as though he had passed his hand over every foot of it.*" Such precise information can only be gained by a close and careful instrumental survey, using for that purpose the level, chain, and compass. These surveys, however, are very expensive, costing both time and money; and as several routes are usually surveyed, whilst only one is finally adopted, it follows, that if any feasible method can be suggested whereby the number of these surveys may be diminished there will be a great saving of both the important elements, time and money; or, since in this utilitarian and practical age, time is money; the saving may be regarded as one of money alone.

It is firmly believed that a proper use of the barometer in all reconnoissances will lessen the number of experimental lines usually survey-

ed, facilitate the location of the road or canal, hasten its construction, and thus confer a benefit upon the public.

Before setting any survey on foot, it is the usual custom for the chief to pass over the proposed line and examine it with the eye alone, selecting "guiding" or "ruling" points through which the road must pass, and gaining all possible information with regard to the country from the inhabitants along the route. The knowledge thus obtained is of great importance, and its benefit is felt when the more careful and accurate observers, the level and chain, follow after, noting with the utmost minuteness every change of grade. But the eye is a very unsafe engineering instrument, and should not be too implicitly relied upon when used without the aids which science and art have given it. It is true that by long practice, some can judge pretty correctly as to the distance of two objects apart, or as to their relative difference of level so long as they both remain in sight: but when space, and forests, and mountains intervene between two stations, A and B—especially if there be a succession of ascents and descents between the two—an engineer, aided by the eye alone, cannot say with any certainty when he has arrived at B, "I am below A," or "I am above A," except in one case, viz: when he has been following the course of a stream. In confirmation of this, two facts will be detailed. The writer was once traveling over a very rough and broken portion of country in company with an experienced and distinguished engineer; they passed from the valley of one stream to that of another nearly parallel to the first, and at about right angles to their direction. The road along which they journeyed ran over a succession of ranges of hills, so that they kept ascending and descending; but as far as they could judge, the ascents and descents appeared to balance each other; and when they arrived at the second stream, they thought they were about on a level with the one they had left. Upon examination, however, the difference of level of the two streams proved to be over two hundred feet! The engineer alluded to, who was formerly an officer in the U. S. A., and who is well known as an able topographer and skilful engineer, exclaimed vehemently against the reliance of engineers upon the unaided eye in reconnoissances of long lines. The second fact is quoted from Lieut. R. S. Williamson's "Report" of explorations made by him in California, to aid in solving the problem relative to the practicability of the "Pacific Railroad." This Report will be referred to hereafter, though enough will be extracted now to answer another as well as the present purpose.

I will now give the results of the survey, merely mentioning here that the profile, as determined by the spirit-level and barometer, agreed remarkably well.

"From the Depôt Camp to the point where the Tejon Creek debouched from the mountains was a distance of two and eight-tenths miles, over unbroken ground. *To the eye this appeared very slightly deviating from horizontality. The level showed a difference of altitude of* 483 *feet, giving a grade of* 173 *feet to the mile.* The barometer made the difference of level 15 feet greater. *I was surprised at this result, which taught that very erroneous impressions must generally be conceived with regard to differences of level if the eye alone is trusted to.*"

The use of the barometer will prevent the occurrence of any such errors, and it is probable that they are numerous. By it the level of one gap in a range of hills or chain of mountains can be compared with that of another, and thus the comparative ease or difficulty of connecting the contiguous plains or valleys by passing through one or the other, ascertained in the shortest possible time and with the least expense. If merely examined *par un coup d'œil* in the reconnoissance, experimental lines must be run through both gaps, and the two routes can only be compared, their relative merits and demerits ascertained, after a long, laborious, and expensive instrumental survey.

By using the barometer, the chief, after his reconnoissance, can say, with almost absolute certainty in any case, which terminus is above the other, which is the highest point along the route, which the lowest, and where the greatest difficulties are to be encountered. The barometer does not indeed give horizontal distances, but in determining the practicability of any proposed route *they* are of subordinate importance compared with differences of elevation. A pedestrian, a carriage, a locomotive, can accomplish horizontal distances with ease, but they cannot so easily ascend and descend hills and mountains. "These are the chief obstacles to the construction of roads and canals, and are the natural enemies of the engineer." By using the barometer he does not lessen their hostility to his improvements, but he discovers in the most expeditious manner where they are weakest, and where he can best attack and most easily overcome them. This is all that is claimed for the barometer as an engineering instrument; and it is enough. Its results are not so correct as those of the level. They are only approximations. It goes before, and, as it were, sketches out the work, gives the outline; the level follows after and completes the picture. But by means of the sketch which the barometer furnishes the level, the latter is enabled to accomplish its work in much less time, and at a vastly diminished expense. Up to the present time the barometer has been chiefly used by travelers in determining the approximate altitudes of mountains, by chemists in ascertaining the specific gravity of gases, and by mariners as a weather glass. Its utility as an engineering instrument has been recognised practically but by few, either in this country or in England; on the continent of Europe it has been (such is the writer's information) more extensively employed.

The recent "Pacific Railroad Surveys," instituted and carried out by the General Government, have been instrumental in calling the attention of engineers more particularly to the barometer, and have demonstrated beyond the shadow of a doubt, its great value as an engineering instrument, particularly where the reconnoissance extends over long lines, and where there are, any where along the line, considerable changes of level.

The reports of the surveys alluded to, and more particularly that of Lieut. Williamson, afford much valuable information on this subject. Lieut. W., as already quoted, states that the profiles "determined by the spirit level and barometer agreed remarkably well." This is important as bearing upon the relative accuracy of the level and barometer. It

will be well, however, to examine in some little detail the comparisons made between the level and barometer by Lieut. W. In the remarks already quoted, he states that the difference of elevation between two points as determined by the level is 483 feet; as determined by the barometer, 498 feet. *Assuming that the result given by the level is absolutely correct*, the error, in that particular case of the barometer, is 15 feet, or +·031056 of the whole, or —·030120 of its own determination. The result of this comparison is, that the barometric difference of altitude of two stations must be diminished by about three-hundredths of itself to get the true difference of altitude.

Denoting by H the true, and h the barometric difference of level of two places.

$$H = h\,(1 - \cdot 03012) = \cdot 96988\, h. \qquad (1)$$

(1) is the result of a single comparison only, and of course cannot be relied upon unless it is confirmed by others. It is proposed to examine the other comparisons made by Lieut. W., and, rejecting only those which are obviously or probably incorrect, to determine the mean error of the barometer according to his observations. If the result thus ascertained is confirmed by other and more extended observations and comparisons, it can be relied on with more confidence.

TABLE I.—*Tejon Ravine.*

Level. (1)	Altitudes. (2)	Barometer. (3)	Altitudes. (4)	Differences. (5)	Per cent. (6)
— 2·1	2333·0	. . .	2327·3	5·7	·002449
— 39·0	2294·0	1·4	2328·7	—34·7	—·014901
—164·2	2129·8	—127·5	2201·2	—71·4	—·032433
—392·8	1737·0	—401·3	1799·9	—62 9	—·034947
—352·6	1384·4	—411·1	1388·8	— 4·4	—·003168
—226 5	1157·9	—249·7	1139·1	18 8	·016504
—218·7	939·2	—224·4	914·7	24·5	·026784
—170·3	768·9	—180·6	734·1	34·8	·047405
—243·1	525·8	—270·9	463·2	62 6	·135146
—136·2	662·0	148·3	611·5	50·5	·082583
—173·1	488·9	—116·6	494·9	— 6·0	—·012124

Explanation of Table.—This table is taken from Appendix C. of Lieut. Williamson's Exploration. (See vol. v., "Explorations for a Railroad Route from the Mississippi River to the Pacific.")

Column (1) gives the level-altitude of each station above the preceding station; (2) the total level-altitude of each station above an assumed station; (3) the barometer-altitude of each station above the preceding one; (4) the total height of each station as determined by barometer above the assumed one; (5) the difference between the corresponding numbers in (4) and (1), obtained by subtracting the numbers in (4) from the corresponding ones in (1); (6) the per centage of the barometric error, and is obtained by dividing the numbers in (5) by the corresponding ones in (4).

The mean result of this comparison is, that the barometer-difference of altitude is too small by +·032597 of itself. Hence,

$$H = (1 + \cdot 032597)\, h = 1\cdot 032597\, h. \qquad (2)$$

Comparing this with (1), it is seen that the errors are just the opposite of each other. Combining (1) and (2) the mean result is,

$$\text{H} = 1{\cdot}0012385\ h, \quad . \quad . \quad . \quad . \quad . \qquad (3)$$

TABLE II.—*Tejon Pass.*

Level. (1)	Alts. (2)	Barom. (3)	Alts. (4)	Differences. (5)	(6)	Level. (1)	Alts. (2)	Barom (3)	Alts. (4)	Differences. (5)	(6)
59 2	59 2	60·8	60·8	— 1·6	— 1·6	109·7	2405·7	125·2	2457·3	— 15·5	— 51·6
239·2	298·4	231·6	292·4	8·6	6 0	186·7	2592·4	191·4	2648 7	— 4·7	— 56·3
184·5	482·9	205·8	498 2	—21 3	—15·3	202·3	2794·7	122·5	2771·2	79·8	23 5
217·4	700·3	228·6	726·8	— 11·2	—26·5	353·4	3148·	348·1	3119 3	5·3	28 8
217·4	700·3	216·7	714·8	0·7	—14·6	689·7	3837·8	797·7	3917·0	—108·0	— 79·2
165·2	865·5	202·3	917·2	—37·1	—51·7	—588·9	3248·9	—600·1	3316·0	11·2	— 67·1
77·9	943·4	39·1	956·3	38·8	—12 9	—147·6	3101·3	—121·7	3195·2	— 25·9	— 93·9
382·2	1325·6	408·9	1365·2	—26·7	—39·6	- -	- -	— 68·3	3126·9	- -	- -
182·1	1507·7	188·9	1554·1	— 6·8	—46·4	— 93·1	3008·2	— 88·5	3038·4	— 4·6	— 30·2
- -	1471·8	- -	1474·9	- -	— 3·1	—290·4	2717·8	—220·1	2809·3	— 70·3	— 91·5
- -	1471·8	- -	1439·6	- -	32·2	— 56·9	2660·9	— 24·7	2784·6	— 32·2	—123·7
- -	1471·8	- -	1411·3	- -	60·5	—104 1	2556·8	—110·2	2674 4	6·1	—117·6
- -	1471·8	- -	1487·4	- -	—15·6	—228·0	2328·8	—234 2	2440·2	6·2	—111·4
182·1	1507·7	- -	1527·0	- -	—19·3	—120·1	2208·7	—135·6	2304·6	15·5	— 95·9
106·5	1614·2	- -	1644·0	- -	—29·8	—112 0	2096·7	—121·1	2183·5	9·1	— 86·8
104·1	1718·3	82·7	1726·7	21·4	— 8·4	— 95·3	2001·4	— 69·0	2114·5	— 26·3	—113·1
577·7	2296·0	605·4	2332·1	—27·7	—36·1	— 60·6	1940·8	— 78·1	2036·4	17·5	— 95·6

Columns (1), (2), (3), (4), and (6) are copied from the table in the "Report." Column (6) is obtained by subtracting the numbers in (4) from the corresponding ones in (2); (5) by subtracting the numbers in (3) from the corresponding ones in (1).

The mean result is, that the barometer-altitude must be diminished by ·020999 of itself.

$$\text{H} = (1 - {\cdot}020999)\ h. = {\cdot}979001\ h. \quad . \quad . \qquad (4)$$

Combining (4) with (3),

$$\text{H} = {\cdot}990170\ h.$$

TABLE III.—*Cañada de los Uvas.*

Level. (1)	Alts. (2)	Barom. (3)	Alts. (4)	Differences. (5)	(6)	Level. (1)	Alts. (2)	Barom. (3)	Alts. (4)	Differences. (5)	(6)
319·8	193 4	- -	213·4	- -	—20·0	246·1	2618·6	235·5	2673·8	—10·6	—55·2
190·9	384 3	190·3	403 7	0 6	—19·4	190·9	2809·5	194·9	2868·7	— 4·0	— 59·2
336·1	720·4	325 7	729·4	10 4	— 9·0	— 51·5	2728·0	— 74·7	2794·0	23·2	—36·0
197·3	917 7	200 1	920·5	— 2·8	— 2·8	—322·8	2435·2	—333·1	2460·9	10·3	—25·7
138·0	1055·8	152·0	1081 5	—14 0	—25·7	— 55·0	2280·2	—146·5	314·4	91·5	—34·2
102·8	1158 6	- -	1205·3	- -	—46·7	—148·8	2131·4	—170·0	2144·4	21·2	—13·0
102·2	1260 8	65·7	1271 0	36·5	—10·2	— 63·0	2068·4	— 71·9	2072·5	8·9	— 4·1
126·2	1387·0	145 2	1416 2	—19·0	—29·2	—103·6	2172·0	117·7	2190·2	—14·1	—18·2
79·6	1466·6	65·8	1482 0	13 8	—15·4	—169·3	2012·7	—152·9	2037·3	—16·4	—34·6
161·4	1628 0	140 0	1622 0	21·4	6·0	— 93·0	1909·7	—100·5	1936·8	7·5	—27·1
146·4	1774·4	147·6	1769·6	— 1·2	4·8	4·7	1914·4	30·8	1967·6	—26·1	—53·2
35·3	1809 7	38·9	1808 5	— 3 6	1·2	39·7	1874·7	55·1	1912·5	—15·4	—37·8
64·3	1874 0	52 6	1861·1	11 7	12·9	47·6	1922·3	71·0	1983·5	—23·4	—61·2
57·1	1931·1	68 5	1929·6	—11 1	1·5	— 52·7	1869·6	— 49·7	1933·8	— 3·0	—64·2
36·6	1967 7	41·4	1971 0	— 4 8	— 3·3	— 51·9	1817·7	—108·6	1825·2	56·7	— 7·5
77·3	2045·0	58·0	2029 0	19·3	16·0	— 67·3	1750·0	— 52·5	1772·7	—14·8	—22·3
61·1	2160·0	106 2	2135 2	—45 1	24·8	— 71·9	1678·5	—133·5	1639·2	61·6	39·3
266·4	2372·5	303 1	2438·3	—36·7	—65·8						

The columns in Table III are the same as in II. The per centage is determined as before, by dividing the numbers in column (6) by the corresponding ones in (4). The mean result is —·006898. Hence,

$$\text{H} = (1 - {\cdot}006898)\ h = {\cdot}993102\ h, \quad . \quad . \qquad (6)$$

Combining with (5),

$$\text{H} = {\cdot}9916365\ h, \quad . \quad . \quad . \quad . \quad . \quad . \qquad (7)$$

In the body of the report, pages 23 and 24, are recorded two other observations, which give as a mean result $+\cdot 019331$. Therefore,

$$\text{H} = (1 + \cdot 019331)\ h. = 1\cdot 019331\ h, \quad . \quad . \qquad (8)$$

Combining with (7),

$$\text{H} = 1\cdot 00598375\ h, \quad . \quad . \quad . \quad . \qquad (9)$$

With regard to the three observations taken from the body of the "Report," pages 23 and 24, viz:—

Level 483.	Barometer 498.	Difference —15.	Per cent, —·030120
" 2665.	" 2621.	" +44.	" +·016787
" 1308.	" 1280.	" +28.	" +·021875

It is proper to remark, that they do not appear in the tables extracted from the Appendix, and consequently they enter the calculations only once, as they should.

Formula (9) is the final result deduced from the observations of Lieut. W. It shows that the barometer-altitude is too small by ·00598375 of itself. For differences of level less than one thousand feet it will be almost inappreciable.

If (9) be combined with the result obtained from the reputed measurements of Black Mountain in North Carolina, the error will be diminished a little.

The following determinations of the height of that mountain have been going the rounds of the newspapers, and are presumed to be correct.

Barometer	6708 feet.	Prof. Mitchell,	1855.
"	6709 "	" Guzot,	1856.
Level	6711 "	Major Turner,	1857.

(Mean of barometers 6708·5); difference +2·5; ℔ cent. +·000372.

$$\text{H} = 1\cdot 000372\ h, \quad . \quad . \quad . \quad . \quad . \quad . \qquad (10)$$

Combining with (9),

$$\text{H} = 1\cdot 003178\ h, \quad . \quad . \quad . \quad . \quad . \qquad (11)$$

If the above reputed measurements of the altitude of Black Mountain are the ones determined by the gentlemen whose names are attached to them, formula (10) is valuable.

The results are remarkable, and, as bearing upon the relative accuracy of level and barometer important. The altitude of the mountain was determined by means of the barometer at two different times, by two different observers, and, probably, with two different instruments. The results differ by *one foot.* The third determination was made by means of the Y-level, by a third observer, and at a different time. It exceeds the loss of the previous determinations by *three feet*, the greater by *two feet*, and their mean by *two and a half feet.* The names of the observers are a sufficient guarantee that every precaution was taken to insure the greatest possible accuracy.

A few such independent determinations of the altitude of the same point are of more value, perhaps, than a number of isolated observations made to determine the altitudes of different points by the same indi-

vidual with the same instrument. And if scientific men, who have opportunity, will only multiply the observations with regard to the height of Black Mountain, the question with regard to the relative accuracy of level and barometer will be set at rest, at least for such high altitudes.

The Report of Lieut. W. does not state what means were taken to secure the greatest accuracy, though it is presumed that every precaution was adopted. The survey appears to have been conducted thus: The party divided; one portion remained in camp and made hourly observations with the barometer; the other ran a line of levels along the route to be surveyed and made hourly observations with the barometer also; the heights of those stations at which the leveling party made barometer observations, as determined by the level and barometer, were then referred to the station in camp. The three tables extracted from the Report, give the results of the three lines run to test the relative accuracy of the two instruments. The observations made with the barometer in camp and along the route were noted at the same instant, and thus the party carried out the instructions of Biot on that subject.

An examination of the tables will show that the difference between columns (2) and (4) are relatively much less than the differences between (1) and (3). By comparing columns (1) and (3), which give the level and barometer-altitudes of the stations with respect to each other, the final error of the barometer is $+\cdot 003252$. Hence,

$$\text{H} = 1\cdot 003252\, h, \quad . \quad . \quad . \quad . \quad . \qquad (12)$$

(12) agrees very well with (11). If their mean be taken,

$$\text{H} = 1\cdot 003215\, h, \quad . \quad . \quad . \quad . \quad . \qquad (13)$$

Between formulas (9), (10), (11), (12), and (13) there is but little difference, and none practically, unless h be considerable.

(To be Continued.)

For the Journal of the Franklin Institute.

Submerging of the Atlantic Cable.

The successful laying of the Atlantic cable, which has recently been celebrated throughout the country, is a work that must revolutionize much of the intercourse that annually takes place between Europe and this country; but, whatever may be its results in this respect, or whether it may in time become useless for the purposes intended, the skill and ability that has been developed in constructing the paying-out apparatus will not be lost; and we have reason to be proud, that to a member of the Franklin Institute,

William E. Everett, Esq.,

Chief Engineer of the United States Navy,

belongs the honor of designing the machines used on board the *Agamemnon* and *Niagara.* The machines were constructed and erected on board each vessel, under his immediate direction and supervision, and

the paying out on the *Niagara* confided entirely to him. Mr. Everett's connexion with the enterprise may be stated as follows: In 1857 he was the Chief Engineer of the *Niagara*, and ordered by the Navy Department to assist in the operations of that year. On the arrival of the ship in the Thames, an examination was made, and it was decided that the *Niagara* did not possess sufficient capacity for the intended duty. This decision was made by the engineers of the company, and a merchant steamer had been selected to take her place. This decision caused great disappointment to every officer on board, and it was at this moment that Mr. Everett stepped forward and informed Captain Hudson that, if he would give his permission, he would make drawings of the ship, and demonstrate that she had the required capacity. Captain H. gave his assent; the plans were made; the capacity proved; the *Niagara* accepted, and the merchant steamer dismissed. During the operations of 1857, Mr. E.'s duties were simply those of engineer of the *Niagara*, and he had no connexion with the operations of laying the cable. After the return of the ships to England, having failed in the enterprise, a meeting of the company was held, at which the captains of the vessels, the engineers of the company, and Mr. Everett were present by invitation. It was unanimously decided that the paying-out apparatus was imperfect, and *must* be completely modified before success could be hoped for. Mr. E. advised that the advice of eminent engineers in England be taken, and he was authorized by them to consult such as he wished, and he called on Mr. John Penn, and through Mr. Penn's introduction, on Mr. Joshua Field, of the firm of Maudsley, Son & Field, and Mr. Lloyd, Engineer in Chief of the Royal Navy. These gentlemen took great interest in the matter, and visited the *Niagara* at Plymouth, to examine the defective machine, and subsequently returned to London, where it was understood Mr. E. was to meet them. Meanwhile he prepared a drawing of a machine having two sheeves, instead of four, as in the old machine. At the subsequent meeting of these gentlemen the majority did not think the four sheeves objectionable, and Mr. E. yielded to their judgment, and their joint report recommends several changes in the old machines. The introduction of Appold's brake, and an arrangement by means of a moveable sheeve and India rubber springs, by which, in case of extra strain, forty feet of additional cable might be paid out. At this point Mr. E. supposed his connexion with the company had ceased, and was much surprised a few weeks after to receive a letter from them, informing him that they wished his services in the construction of the new paying-out machines, and had made application to the Secretary of the Navy for that purpose. This permission was subsequently granted, and Mr. E. returned to England in January last, when the whole duty of designing and directing the construction of the new machines was confided entirely to him. The first five weeks after his arrival was consumed in erecting the old machines, two steam engines and four boilers, for the purpose of experiment. The month of March was consumed in experimenting on Appold's brake, before any satisfactory results were obtained; the difficulty being, that when running with any given

strain, say 2000 lbs., if the machine was stopped the clinging of the brake blocks to the drum was so great, that to put the machine in motion would require 100 ℔ cent. increased strain, say 4000 lbs. This would have been fatal to the success of any machine; and fortunately it was obviated at the last moment, by cutting the surface of the brake blocks into sections of one and a-half inch square. It must be understood that Appold's brake was a patent machine used in England, and that Mr. E. only adapted it to this particular duty. From all these experiments, he became convinced that a machine with two sheeves would be superior to one with four, and he immediately commenced the construction of the first machine, which, as soon as completed, worked to his entire satisfaction. The directors of the company invited most of the prominent engineers of London to examine it, and suggest any change that they might think would be of advantage; not one suggestion was made. In addition to this, Messrs. Penn, Field, and Lloyd, addressed a letter to Mr. Cyrus W. Field, stating that they had fully examined it, and had not any alterations to suggest, as everything appeared well adapted to the intended purpose. This letter does those gentlemen great credit; for as the machine differed materially from that recommended by them, and did not use the movable sheeve controlled by India rubber springs, it shows them to have been above every selfish feeling, in cheerfully endorsing Mr. Everett's apparatus. At this time Mr. E. received the following letter from the Secretary of the Company:

"Atlantic Telegraph Company,
"22 *Old Broad Street, London, April* 24, 1858.

"Dear Sir,—As you have reported to the Managing Committee that the paying-out machinery for H. M. ship *Agamemnon* is completed, and that it has been working satisfactorily during the last three days, and that you do not consider any alteration necessary to increase its efficiency; and as another set is required for the United States Frigate *Niagara*, the Managing Committee have authorized and instructed me to request that you will immediately give directions to put another set in hand for that ship; and I am further to request that you will continue your supervision over the construction of the machinery, and also undertake to superintend and direct its being properly fixed and fitted on board the *Niagara*.

"I am further instructed to request, that you will take charge of the operation of experimenting upon, and subsequently of paying out, the cable from the ship; in doing which, you will have the co-operation of Messrs. Woodhouse and Follansbee, and of such other engineers as you may consider it requisite to appropriate to such service. You are also authorized to make such preparations and arrangements as are necessary to enable you to carry out the foregoing instructions.

"I remain, yours, truly, George Saward, *Secretary*.

"To W. E. Everett."

After this his duties were very clear; the first machine was erected on the *Agamemnon*, and a second one constructed and erected on the *Niagara*. The organization of the corps immediately engaged in paying out the cable was as follows: Mr. Everett, assisted by Mr. Woodhouse, took alternate watches in the general supervision and direction of everything pertaining to the cable, and the process of paying out. Chief Engineer, Follansbee, and Second Assistant Engineer, Kellogg, kept alternate watches at the paying out machine, assisted by Mr. Gooderich and Mr. Hudson, who attended the dynamometer. In addi-

tion to the above, there was an officer always in charge at the coil, where were two wire-men as leading men, two splicers, and one gutta percha jointer. Sixty of the crew of the *Niagara* were permitted by Captain Hudson to enter the employ of the Company. These Mr. E. divided into two watches; fifteen were placed in the coil to assist the wire-men; five were placed near the machinery to clear away the tar, and the remainder along the line of the cable, from the coil to the stern-wheel.

From the coil to the engine-room was a speaking tube, through which were passed *all* orders controlling the speed of the ship, which it was necessary to vary continually.

It will be seen, that the submerging of the cable and the navigation of the ship were two distinct operations, in charge of different persons. Had the cable broken from any defect in the paying-out apparatus, no one could have blamed Captain Hudson. In conclusion, I would state that Mr. E.'s machines differ from any before constructed for that purpose; that the builders required his signature to every drawing, before putting it in hands; and that while he is specially indebted to Mr. Penn for his advice, and the friendly interest taken in his success, and also to Messrs. Field, Lloyd, Appold and Amos, for their aid and assistance, he is to all intents the designer of the paying-out apparatus, and, be it good or bad, it is his. To his companion and friend, Mr. Woodhouse, who took alternate watches with him during the process of submerging the cable, Mr. E. must ever feel much indebted.

Description of Machine.—The machine is placed at the after part of the vessel, a little on the starboard side, so as to be clear of the masts. The cable as it comes up from the hold, passes through a groove, and over a grooved wheel, and from thence on to the drums, of which there are two; each of these drums has four deep grooves in it, and the cable after winding round them four times, passes on from the last groove over a guiding wheel to a second machine, placed half-way between the first and the stern of the vessel. This second machine is for the purpose of indicating and regulating the amount of tension on the cable, so as to prevent it from running over the stern too fast, and at the same time not to allow the resistance to become so great as to endanger its breaking. The engineer applies the amount of weight he thinks necessary to accomplish the desired object; this weight is on a sliding frame, through which passes a rod; the lower end of this rod is attached to a piston, which works loosely in a cylinder of water, and the upper end is secured to a grooved wheel, under which the cable passes on its way to the stern; the cable thus sustaining the weight that has been applied on the sliding-frame. The piston below working in the water cylinder, is for the purpose of preventing sudden changes; for as the weight rises or falls, the water in the cylinder must pass around the piston, either above or below it. On the frame of the sliding weight is an index which gives the exact strain on the cable. Forming a part of this second machine is a wheel like

the steering wheel of a ship, with a drum attached to it; from this drum a chain passes back to the first machine, and connected to the levers of four powerful brakes; these brakes operate on four smooth wheels or pulleys by means of clamps, which are made to adhere in a greater or less degree, as more or less tension is wanted on the cable. Each one of these brakes has sliding weights applied to its lever, which may be slipped on or off, at the engineer's pleasure, and they also have pistons working in cylinders of water to prevent sudden action. In addition, each brake has Appold's self-acting apparatus for keeping the strain uniform. With these several arrangements, we will suppose the vessel in motion, and the cable passing through the two machines, and over the stern. A man is stationed at the wheel, with his eye on the index. As the ship rolls and pitches, she records the increased or reduced tension on the cable, and the man at the wheel tightens or slacks off on the brakes, thus keeping the strain almost perfectly uniform. To prevent the friction brakes from heating, the pulleys on which they operate work in tanks of water. The success of the machine may be inferred from its paying out the cable on the *Niagara*, without stopping once. FRANKLIN.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED FROM AUGUST 3 TO AUGUST 31, 1858, (INCLUSIVE,) WITH EXEMPLIFICATIONS.

AUGUST 3.

1. CULTIVATORS; William Adams, Detroit, Michigan.

Claim—The arrangement of the loop at the juncture of the cross and side bars, in combination with the binding pin and the double looped yoke extending transversely from one side bar to the other, for holding the handles.

2. GOVERNOR FOR STEAM ENGINES; Alban Anderson, Lancaster, Ohio.

Claim—The combination of machinery and the production thereby, or by its equivalent, of the resultant force defined, and the application of such resultant force to the regulation of the movement of machines or engines.

3. WHEAT SEPARATORS; W. H. Angel and M. Coffeen, Watertown, New York.

Claim—1st, The arrangement of the three perforated plates, having holes of the same diameter or area, and placed at the same inclination with the fourth perforated plate, having holes of a less diameter or area than the other plates, and at a greater inclination. 2d, The spring bar or rod and yoke, in connexion with the plates and bars at the other end of the plate box, for giving to the plate box the compound motion.

4. KNIFE SHARPENER; John J. and Austin T. Armstrong, Brooklyn, New York.

Claim—The combination and arrangement of parts described, that is to say, securing the file by its edges between the inclines, by which the advantages stated are secured.

5. STEAM ENGINES; Henry and F. J. L. Blandy, Zanesville, Ohio.

Claim—The application to portable steam engines of a hollow continuous bed plate, for the support and attachment of the operative parts of the engine, whereby the latter in working is rendered independent of the contraction and expansion of the former, and the boiler relieved from the direct strain of the engine.

6. METHOD OF REMOVING SUBMARINE DEPOSITS; Eli Brazelton, St. Louis, Missouri.

Claim—Removing sand, mud, or gravel from within sunken wrecks, or from submerged articles, with a view of raising the same, by means of a current of water forced by any proper means through a tube or spout, by which the current is directed and made to act at the desired spots.

7. SUBSTITUTE FOR THE CRANK; Aaron Brooks, Crawford County, Indiana.

Claim—A perpendicular pitman and the dispensing with a crank by means of the wheel attached to the shaft, and the slide or rollers attached to the pitman, and moving in the groove, the said pitman always moving perpendicular.

8. FLOURING MILLS; Robert J. Brown, Perry, Pennsylvania.

Claim—1st, The combination of cups without backs, with a perforated strap, for the purpose of elevating and discharging meal. 2d, The combination of a ribbed pulley with a conveyor on the bolting shaft. 3d. The arrangement of two, three, or more bolts within and concentric with each other, and upon the same reel shaft.

9. Grain and Grass Harvesters; Robert Bryson, Schenectady, New York.

Claim—Placing the cam in front of the driving-wheel, and operating therefrom by means of the double crank and the rods, when these several parts are constructed and arranged relatively with respect to each other and to the bar, in the manner set forth.

10. Metallic Fence; William Bush, Harrisburgh, Pennsylvania.

Claim—The construction of the base rail with a continuous dovetail groove, into which are slipped the panels with a corresponding tenon, and the top rail with continuous groove fitting on the top of the panels.

11. Converting Reciprocating into Rotary Motion; Isaac Chapman, City of New York.

Claim—The ratchet wheel or wheels, in combination with the pawls, arranged and operated by means of a parallel motion. Also, the manner of throwing the pawls in and out of gear with the ratchet, while the power is in motion, by means of the levers and the parallel spring slide.

12. Apparatus for Making Coffee; John Deniey and Thomas H. Heberling, Warsaw, Illinois.

We do not claim the process of scalding coffee and boiling it afterwards by additional heat, or forcing water through ground coffee resting in a strainer. Nor do we claim the application of a heater to a vessel containing coffee.

Claim—1st, The apparatus for the forcible expulsion of the water through the bed of the coffee, resting on the strainer in the mouth of the inverted vessel by the pressure of steam in the upper part thereof, produced when the red-hot heater is inserted in the central tube. 2d, The cup for retaining a part of the water around the foot of the heater tube and the tin arch, for the purpose of preventing the joint at the end of the heater tube from becoming unsoldered when the rest of the water is driven from the interior of the vessel.

13. Railroad Frog; James M. Dick, Buffalo, New York.

Claim—1st, The construction of the chairs and arrangement of the parts of the frog upon them, in the manner by which I am enabled to remove any part of the frog without disturbing the other parts. 2d, The combination of the underhanging jaw upon the rail, E, with the rebated chair. 3d, Arranging the frog upon chairs in such a manner as to leave open space below the rails at the point where the rail, E, comes up to the rail, B and C.

14. Cop Tubes for Shuttles; James Eaton, Townsend Harbor, Massachusetts.

I do not claim the use of a cop tube of entire length of the spindle, when used alone and unconnected with the button, or its equivalent, to guide the yarn over the point of the spindle.

Claim—1st, The employment of a button upon the end of the spindle or of the cop tube. 2d, In combination with the above, I claim a cop tube of a length sufficient to hold the entire cop. 3d, A removable spindle in combination with the button and long cop tube operating in the manner set forth.

15. Lamps; William Fulton, Cranberry, New Jersey.

Claim—The register formed of the perforations in the top, and the perforated plate placed within the top, in combination with the perforated or air-distributing plate.

16. Sleeping Car for Railroads; Charles L. Harrington, Buffalo, New York.

Claim—The single rods in relation to the berths or couches, Nos. 1 and 2, the said rods being without collars or projections, and attached at each end to the side of the car, in combination with the shifting seats with slotted arms, and reversible and convertible backs, the rail, and bed, with the partitions.

17. Tube for Conveying Sound; R. G. Hatfield, Mount Vernon, New York.

Claim—The mouth in combination with the reflector, the mouth and reflector being of paraboloidal or approximate form, and arranged relatively with each other, so as to operate substantially as set forth. Further, the plate placed in the elbow, as described, and also the combination of the mouth, reflector, and plate, when arranged to act conjointly, as described.

18. Apparatus for Condensing and Purifying Gas; August Hendricks, Assignor to Victoria Hendricks, City of New York.

Claim—1st, A gas condenser which has the junction between its upper and lower chambers accomplished by means of a water channel formed round the upper edge of the lower chamber, and a flanch formed round the bottom of the upper chamber, in combination with stationary rods, which sustain the upper section and adjusting suspension screws, or their equivalents, weights, cords, and pulleys. 2d, The specified arrangement of condenser and purifier on the same level and within the same chamber.

19. Field Fence; David M. Heikes, Franklin Township, York County, Pennsylvania.

Claim—The construction of the fence into separate panels by framing the posts, uprights, and rails together by means of beveled tenons and mortises, and the application of the circular braces, by the application of which the fence can readily be raised or lowered at one end from a horizontal to any angular position, and the posts and uprights will in every case stand perpendicular to the ground.

20. Field Fence; Cornelius Horton, Phelps, New York.

Claim—The combination of the staple with the two panels, the braces, and the key or pin.

21. Gas Stoves; Moses W. Kidder, Lowell, Massachusetts.

Claim—The condensing chamber with its trap and pipe, in combination with a combustion chamber.

22. Gas Burners; Frederick C. Krause, City of New York.

I do not claim to be the first inventor of a porous gas burner, as I am aware that they have been constructed of wire gauze, and by making beds of such material covered with broken pumice stone, and of some other substance. But I

Claim—The manufacture of gas burners, or those parts of them from which the gas is to be emitted, of the porous composition produced by the union of the substances specified, in the manner set forth.

23. Mode of Separating Fibre; Azel Storrs Lyman, City of New York.

Claim—The mode of separating the fibres of wood, flax, or other fibrous substances, for paper, cloth, or other purposes, by charging the mass with hot water, steam, compressed air, or other elastic fluid, while in a cylinder or other suitable receptacle, and then causing it to be projected from said receptacle into the atmosphere, or any space where it is subjected to a sufficiently less pressure to cause its disruption by the sudden expansion of the fluid within it.

24. Preserve Cans; Emmons Manley, Marion, New York.

Claim—The combination of the depression around the mouth of the can, and the cup-formed stopper, constructed and operating substantially as described.

25. MODE OF OPERATING PRESSES; David L. Miller, Madison, New Jersey.

Claim—The application of two distinct actions by means of the bevel gearing, endless screw gear, barrel, and cylindrical nut, arranged as described.

26. PRINTING PRESSES; Frederick B. Nichols, Morrisania, New York.

Claim—1st, The employment of the polished metallic roller, arranged immediately in front of the inking roller, and made adjustable by set-screws, so as to enable its smooth periphery to be pressed against the periphery of the printing cylinder on a line parallel with the axis of both, and with such force as to prevent any ink on the engraved surface of the printing cylinder from passing between the two, and thereby removing the excess of ink from the smooth portions of the electrotype or thin plate, and causing the same to descend over the rising side of the said polished roller into the ink trough. 2d, Arranging the rollers and endless band over the same, in front of, and in such relation to the periphery of the printing cylinder, as to cause the descending portion of the endless band to extend from the same, tangential to a circle smaller than it in diameter, and to bear upon a portion of the periphery with an equal degree of tension over every part which it touches, and giving to the said part of the endless band a zigzag movement by means of the zigzag grooved drum and lug or arm.

27. SAFETY WHIFFLE-TREE; George F. Oulten, Norfolk Co., Virginia.

Claim—The hooks constructed with two different angles, and which allow the traces to commence detaching as soon as they commence revolving, and are released entirely at one-fourth of a revolution.

28. MONEY TABLE; Wm. Painter, Wilmington, Delaware.

Claim—The combination of the dish or seat with its levers and slotted guide, seated and arranged as set forth, composed of wood or of a metallic substance, or composed of both wood and metal, for the purpose of a money-changer or money-receiver; not limiting myself to the exact form of the dish or seat, so that the construction is substantially the same as to guide the money without any possibility of its falling elsewhere than into the palm of the hand.

29. HUBS FOR CARRIAGE WHEELS; Norman Platt, Jackson, Mississippi.

Claim—The combination of a flanched metallic hub for carriage, wagon, and buggy wheels, with clips to stay and strengthen the spokes, together with a metallic boxing for said hub, secured by a swelled head screw and tap.

30. STOVES; Andrew Ralston, West Middletown, Pennsylvania.

Claim—1st, The arrangement of the side chambers, the centre chamber, and the regulating valves of the fan on the collar of the stove, where the pipe is usually attached. 2d, The arrangement of the curved bearing, the opening, the cam ratchet, the ratchet pawl, the damper with its three journals, and the division plate, as described. 3d, The arrangement of the plates with their division pieces, and the openings, and the large openings for the cooking vessels, as described.

31. COMBINED BROILING FURNACE AND COOKING RANGE; Wm. Resor, Cincinnati, Ohio.

Claim—The arrangement of the grates, passages, and dampers, or their equivalents, to temporarily connect the charcoal grate with the main fire, so as to ignite its contents, and afterwards disconnect them so as to burn independently.

32. BRAKES FOR RAILROAD CARS; John W. Rice, Springfield, Massachusetts.

Claim—1st, The nut and screw, and its arrangement, when used for braking railroad cars. 2d, The bar extending from one brake to the other, the double fulcrum lever, and the rods playing through and against the double fulcrum lever, and the arrangement of the chain and pulley, when used in combination with each other.

33. OX YOKES; Joseph H. Riggs, Gloucester, Massachusetts.

Claim—The racks, arranged and operating in the manner substantially as set forth.

34. CHUCKS FOR CENTERING, &c.; Daniel N. Smith, Boston, Massachusetts.

Claim—The centering tool, consisting of the chuck operating in combination with the shafts.

35. SEWING MACHINES; E. Harry Smith, City of New York.

Claim—Forming the stitch by means of the detached looper specified, operating in combination with the needle, and passing entirely through the loop, in the manner described. Also, the spreader on the side of the looper, for the purposes specified. Also, the revolving and oscillating lever, when constructed and arranged to drive the looper.

36. ARGAND GAS BURNERS; Joseph E. Stanwood, Malden, Massachusetts.

Claim—The improved Argand burner, as made with its several supporting tubes of its annular chamber extended down within the lower or receiving chamber and around its entrance hole or passage, substantially in manner as described, and for the purpose of preventing noise or singing of the flame when the burner is in operation. Also, the combination and arrangement of the perforated partition, with the annular or upper chamber of the burner, and having its perforations or spaces between the same, disposed with respect to the mouths of the inlet tubes.

37. APPARATUS FOR PURIFYING GAS; Andrew Walker, Claremont, New Hampshire.

Claim—The construction of the cover of the horizontal washer with teeth, as described.

38. PEGGING MACHINES; Edgar M. Stevens, Boston, Massachusetts.

Claim—1st, A peg wood box or receptacle, s, which is vibrated or reciprocated so as to bring the peg wood upon the knife, for the purpose of splitting a peg from the peg wood, and which is so located and arranged as to present the peg to, or directly over the hole in the sole into which it is to be driven. But I do not claim, broadly, any moving peg wood box, which is arranged remotely from the awl hole, made in the sole, and there delivers the peg wood or pegs, which ultimately are fed to the awl hole into which they are to be driven. 2d, In combination with the vibrating or reciprocating peg wood box, s, a stop which is adjustable to the length of the peg wood, and is located in the mouth of s, near the peg tube in f, and within less distance of the plane of the edge face of the knife than the bigness of one peg, and whose function is to hold the peg wood against the action of the knife in splitting off the peg, and this I claim whether such stop forms a part of the cover of the peg wood box or is separate therefrom. 3d, I am aware that it is not new to use a feed instrument having a compound movement like that described for m, that, therefore, I disclaim. But I claim the mechanical means, or their equivalents, for producing said compound movement of m, the same consisting of the bell crank lever, u, hinged to m, and the friction block, w, which is arranged to slide in the slot in u, both u and

w being arranged to pivot upon x. 4th, The use of a spring (the spring on v), or its equivalent, in combination with a peg wood feeder, m, having a range of feed movement, when unobstructed, greater than the bigness of a peg, for the purpose of rendering the movement of the feeder, m, self-regulating.

39. Case Shoe Brush; Charles D. Thum, Philadelphia, Pennsylvania.

Claim—The combination of the brushes and case, as shown, the same being made of suitable material, such as wood, metal, india rubber, or its equivalent, and of any desirable shape.

40. Harvesters; J. V. Trump, Somerville, New Jersey.

Claim—The combination of the knife guards with the press plate, the finger beam, and the reciprocating cutters, when these several parts are constructed and relatively arranged as described.

41. Fire Places; Wm. R. Warden, Boston, Massachusetts.

Claim—The combination and arrangement of the ornamental metallic frame, D, and vertical slide, F, containing smoke-pipe opening within the fire place, in the manner described.

42. Apparatus for Purifying Gas; John Waterhouse, Little Falls, New York.

Claim—Introducing the gas into the purifier underneath a table, or its equivalent, near the surface of the lime water, so that it (the gas) shall pass horizontally through the lime water a sufficient distance to effect its purification, before it can rise to the chamber above, as set forth, by which means I obviate much of the pressure heretofore encountered in lime water purifiers, and get a better yield at a great saving of retorts.

43. Railroad Rails; M. J. Waldron, Dunkirk, New York.

Claim—1st, Placing the ends of the rails in a suitably constructed chair between two ties, both of the ties being used as a bearing or supporting surface to the chair. 2d, The bolt in the enlarged recess in the ends of the rails and the jaws or lapped part of the chairs as an arrangement of means for forming an elastic or spring joint for the ends of the rails.

44. Looms; Joseph Welch, Philadelphia, Pennsylvania.

Claim—Reducing the normal capacity of the pattern wheel, or its equivalent, so as to make it perform the functions described, substantially in the manner set forth.

45. Sleeping Cars for Railroads; Eli Wheeler, Elmira, New York.

Claim—In connexion with a pair of car seats which are enclosed within a compartment, and placed at the proper distance apart, pivoting by fixed pivots the backs of said pair of seats at such points on the arms of the seat frame, and in such relation to each other, that by turning the backs over in opposite directions, in the path of a vertical circle, they will both be brought and made to lie horizontally or on a level with the cushions of the seats within the space existing between the two seats, and upon a supporting cleat, F, and thus form a comfortable sleeping couch entirely enclosed within the compartment.

46. Sewing Machines; Darius Wheeler and Luman Carpenter, Oswego, New York.

Claim—The combination of the notched looper with the needle spring pins and cam plate, whereby one end of the looper takes the loop and the other end discharges it upon the needle, while the looper is moving continuously in a circle. Also, the form of the looper, whereby as the looper progresses through the loop, the loop by the combined action of the needle and looper becomes shorter than when first taken, and is removed entirely out of the path of the point of the looper at and after its discharge, so that it cannot be taken again by the looper.

47. Method of Registering the Motion of Machinery; S. Lloyd Wiegand, Philadelphia, Pennsylvania.

Claim—1st, Reversing the motion of the zones or indicating dials by friction applied to them in the manner set forth. 2d, The arrangement of the spring, L, to act as a detent in reversing.

48. Seed Planters; James D. Willoughby, Carlisle, Pennsylvania.

Claim—The arrangement of the rollers placed horizontally with the slide, as constructed, for regulating the discharge of seed, and the frame for keeping said roller in place, and preventing the lateral discharge of seed.

49. Stoves; J. H. Wilkinson, Concord, New Hampshire.

Claim—1st, The arrangement of pipe, K, within pipe, E, and damper, L. 2d, Inserting the air chambers, J J, in the linings of the fire-pot. 3d, The holes, m m, in connexion with the bed plate, O, provided with the arch piece, S, or their equivalents.

50. Machine for Manufacturing Shoe Pegs; I. G. Worth, Vassalboro', Maine.

Claim—A combination and arrangement, essentially as specified, of a vibrating knife, or its equivalent, a bench or table, two fluted rollers, and mechanism for imparting to such rollers intermittent feeding motions, in opposite directions, the same being productive of advantage in cutting blocks into pegs.

51. Electro-Magnetic Engine; Frederick Yeiser, Lexington, Kentucky.

Claim—The employment of a series of balanced beams with bars arranged and combined with the magnets, frame, and rod.

52. Butter Worker; W. Bancroft, Assignor to self and H. M. Proctor, Burlington, Vermont.

Claim—The combination of the roller, P, with the roller, J, and share, O. Also, the combination of double geared shell pinion, D, with the basin, A, adjustable shaft, H, socket, E I, and pinion, G, so that by turning the screw, K, the shaft, H, may be raised or lowered, and the height of the roller, J, altered at pleasure.

53. Mechanical Jack; Amos Jones, Assignor to self and S. M. Davis, Lebanon, New Hampshire.

Claim—Constructing an improved jack by combining a double toothed shank with a suitable head-piece, when the teeth of said shank are arranged in such a manner as to furnish the necessary fulcrum and catches for the operating lever in the performance of its appropriate functions.

54. Machine for making Beef and other Steaks Tender; Thomas W. Moore, Assignor to Elliot & Moore, Plattsburg, New York.

Claim—The combination of joint, lever, and the jaws, when the devices are so arranged that the jaws operate in relation to each other, substantially as specified.

55. Centrifugal Gun; C. B. Thayer, Boston, Assignor to self and Charles Robinson, Cambridgeport, Mass.

Claim—The spiral groove, d, arranged as specified. In combination with the spiral groove, d, I also claim the space, g, and heel, h, at the extremity of each arm or aperture of the thrower.

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56. Straw Cutters; Darius Babcock, Dryden, New York.

Claim—Operating the feed rollers through the medium of the levers, F F, rods, H H, connected with said levers by means of the sliding collars, pawls, and crank pulley.

57. Machine for Threshing and Separating Grain; N. J. Becker and J. M. Harvey, Amsterdam, N. Y.

Claim—The combination of the swinging arm or arms, straw carrier brackets or projections, elbow lever, connecting by links the swinging arm to the separator, pitman, operated by crank pin from the fan shaft to drive the swinging arm, and fan, and threshing cylinder pulleys, and driven by the same band or belt, as set forth. We do not claim the combination of a reciprocating or independently moving perforated straw carrier with a stationary bed-plate, but as gearing the serrated bar frame to the perforated bed-plate and conducting board, that said latter portion shall give an accelerated motion to the bar frame simultaneously with, but in reverse directions to, the travel of the bed-plate; providing the feeding throat of the thresher, or thresher concave, with a dust spout or outlet above, and furnishing the cylinder race with a dust passage in front, under the feed table.

58. Seed Planters; Addison Berdan, Macon, Michigan.

Claim—The arrangement of the reciprocating piece, adjustable tubes, stationary piece, and top plate, with hoppers.

59. Harrow; Addison Berdan, Macon, Michigan.

Claim—The combination of tooth bars having projections, with guide, oscillating lever, and frame, the whole being constructed, arranged, and operated as set forth.

60. Machines for Rolling Leather into Bales; Nathan Burk, Fulton, New York.

Claim—In combination with the winding and clamping shafts, the spring table, with its friction roller, stops, and string guides.

61. Wind Guard for Chimneys; F. M. Butler, City of New York.

Claim—The arrangement of the pipe, radial guard, inner disk, and hood, when in substantially the proportions specified.

62. Operating the Teeth of Cylinders for Burring Wool, &c.; T. B. Butler, Norwalk, Connecticut.

Claim—The application of teeth to a rotating cylinder having an uniform peripherical surface, in such a manner as to be projected beyond the said surface to catch the fibrous materials to be operated upon, and afterwards retracted into pockets within the said peripherical surface, for the purpose of holding said material and presenting the greater portion of it upon the even peripherical surface of the cylinder without any obstruction to the action of strippers, brushes, or other analogous devices for burring, ginning, or cleaning it, operating in combination with said cylinder.

63. Machine for Chamfering and Crozing Barrels; A. H. Crozier and Cyrus Carrier, Oswego, New York.

Claim—The method described of moving the crozing and chamfering tools to and from their work, by means of the differential movement of the wheels, Q and S, produced in the manner described, when operating the cam or eccentric which controls the action of the tools.

64. Metallic Lath Surface; John B. Cornell, City of New York.

Claim—The shape of the sheet metal sections, which enables them to securely retain coatings of plaster, when the said sections are secured to vertical supports, and which also enables said sections to be securely combined with partition studs without the aid of nails, screws, or bolts.

65. Safety Guard for Safe Doors; John B. Cornell, City of New York.

Claim—Arranging a safety guard within the door of an iron safe, in such a manner with relation to the lock or locks, and the fastening bolts which are combined with said door, that the act of forcibly displacing the said lock or locks from its or their proper position on a locked door, will cause the said safety guard to be thrown into such a position that it will securely hold the said fastening bolts in an extended position from the moment that the lock bolts cease to exert a retaining action on the said fastening bolts.

66. Applying Brakes to Hand Trucks; C. L. Daboll, New London, Connecticut.

Claim—The application of the described devices to hand trucks, in the manner set forth.

67. Apparatus for Purifying Gas; W. F. Danowsky, Allentown, Pennsylvania.

Claim—The use of the purifier, when arranged and combined with a gas trap, in the manner described.

68. Treatment of Caoutchouc; Austin G. Day, Seymour, Connecticut.

Claim—Running the heat for vulcanizing elastic hard rubber compounds, as set forth, through the several grades of temperature, and the several intervals of time described. Also, making the elastic hard rubber composition of two parts by weight of rubber, and one part of sulphur, when such composition is made preparatory to the running of the heat through the several grades of time and temperature. Also, equalizing the temperature in the heating apparatus by mechanical means or by a current of steam, or its equivalent.

69. Bed Bottom; W. H. Elliott, Plattsburg, New York.

Claim—The combination and arrangement of braces, flexible strap, slats, and springs, whether the said braces reach from one outside slat to the other, or only to some of the intermediate slats, and whether said braces are attached to the upper or lower side of slats.

70. Hinges; W. H. Elliott, Plattsburg, New York.

Claim—Combining with the table hinge a portion of the rule joint, as specified.

71. Harvesters; M. E. Ellsworth, Hudson, Ohio.

Claim—The manner of attaching the seat to the gear plank by means of the rods, or their equivalents, having a pin or hinge point both upon the gear plank and foot-board, in combination with the rods, or their equivalents, which connect the foot-board directly with the reach-board.

72. Apparatus for Tanning Hides; L. C. England, Oswego, New York

Claim—Causing the liquors to circulate among hides, which are kept in fixed positions, for the purposes set forth.

73. Seed Planters; H. C. Fairchild, Brooklyn, Pennsylvania.

Claim—The rotating or semi-rotating seed-box, provided with the cylindrical case, B, fitted within the case,

C, in connexion with the plunger connected with and operated by the movement of case, B, as shown, the plunger case attached to case, C, and the seed distributing device formed of the perforated bottoms of the cases, B C, and the cut-off.

74. CULTIVATORS; N. W. Fraser and A. J. McLellan, Laporte, Indiana.

Claim—The arrangement of the fender attached to the shovel standards, the shoves, and the wheels, on the vertical shafts, the whole being arranged for joint operation.

75. SEWING MACHINES; James E. A. Gibbs, Millpoint, Virginia.

Claim—So constructing and combining or arranging and operating a revolving hook or looper with a reciprocating needle, as that the one loop shall be taken from the needle after the former loop shall have been drawn up on, along, or over the needle during its advance movement, in the manner described. Also, the conical sleeve, or its equivalent, for holding the spool and for revolving therewith, in combination with the adjustable cones, or their equivalents, for producing the requisite degree of friction upon the conical sleeve spool-holder, when constructed so as to operate substantially in the manner set forth.

76. LOCOMOTIVE STEAM ENGINES; John C. Hagan, Nashville, Tennessee.

Claim—1st, Arranging the cylinder of a steam engine so that it is free to move at right angles to the motion of its piston rod, and in a plane parallel with the plane of motion of the cranks connected with the rod. 2d, In combination with the cylinder of a steam engine, arranged so that it is free to vibrate, I claim connecting each end of the piston rod with the crank of a driver, and giving motion to both drivers in the same direction, without the interposition of connecting links. 3d, Giving to the cylinder of a steam engine a positive reciprocating motion, by combining therewith a secondary engine, or any equivalent mechanical device, arranged so as to support and move the cylinder in a plane parallel with the plane of motion of the cranks connected with its piston rods, and in right angles to the line of motion of the piston rod. 4th, Supporting the main cylinder in the guides in which it vibrates by means of trunnions, arranged as described, so that the cylinder may accommodate itself to the axles of the drivers on an uneven track. 5th, Connecting the slide valves of the secondary engine with the quadrant block of the expansion gear of the main engine, by which means the motion and the changes in the valves of both engines are uniform and simultaneous. 6th, The combination of the slotted link, the cam block, the pump hand gear, or any mechanical equivalents, whereby not only can the length of stroke of the pump be varied during the motion of the engine, but also the pump may be worked while the engine is at rest. 7th, Combination of the sliding steam pipes with the main driving cylinder, arranged for the purpose of admitting steam to the cylinder.

77. CLOTHES RACK; A. A. Harris, Ravenna, Ohio.

Claim—The radial arms, so jointed or pivoted to hubs that they will be supported by the joints or attachments to the hub, the hubs being loose on the staff so as to revolve, and at equal distances apart, to form a series of horizontal and parallel frames, each of which series may be folded up separately and the whole be adjusted vertically by the main staff.

78. APPARATUS FOR HEATING AND COOLING AIR TO BE USED AS A MOTIVE POWER; W. Hidden and J. Reeves, City of New York.

Claim—Heating air in one section of a rotating or reciprocating cylinder, and at the same time condensing the exhausted air from the engine in another section of the same cylinder, and at intervals changing the condensing section into a heater, and the heating section to a condenser, by revolving or reciprocating the cylinder so as to alternately have the upper section occupy the place of the lower section in a tank of water, and the lower section to occupy the place of the upper one in proper relation to a furnace flue.

79. TELEGRAPHIC INSTRUMENTS; George B. Hicks, Cleveland, Ohio.

Claim—The described devices, or their equivalents, by means of which two armature levers, one of which is upon the receiving instrument, and the other upon the recording instrument, are moved simultaneously, as seen in figures 4 and 6, in order to render it impossible for any portion of the current from M2 or N2 to pass through the magnets, M M or N N, figures 2 and 5, except when required to change the position of lever, G, G′. Also, the described arrangement for so connecting a circuit through the armature levers of the receiving and recording (local) magnets, figures 4 and 6, that a current may be diverted through the magnets, M M or N N, figures 2 and 5, at the pleasure of a distant operator, and thereby changing the position of the lever, G G, figures 2 and 5, for the purpose of enabling the operators upon two distant circuits to transmit intelligence from one circuit to the other without the aid of an intermediate operator, by the means and in the manner specified. Also, the employment of the devices named, or their equivalents, whereby a current from the battery, S, may be diverted from one magnet, M M, to another, N N, as set forth, by means of the arm, I, (upon the lever, G G, figures 2 and 5,) striking upon Z Z′, as the lever, G G′, is depressed at X or X′.

80. SHIP'S WINDLASS; Peter H. Jackson, City of New York.

Claim—The bit taking the end of the shaft, when combined with the brace, block, and key, or their equivalents.

81. CABLE STOPPER; Peter H. Jackson, City of New York.

Claim—The combination of the cam lever or levers with the hinged pawl, in the manner specified.

82. HANGING WINDOW SASH; Ross Johnson, Frederick, Maryland.

Claim—Side boxes constructed on the face of the jamb, and arranged in front and at right angles to the face of the sash, in combination with narrow oblong weights, and with pulleys, arranged in a manner adapted for the use of side boxes and flat weights.

83. SEED PLANTERS; E. W. Kimball, Ottawa, Illinois.

Claim—The slide placed within the box or case perforated at D, and provided with the endless band and the seed cap attached, in connexion with the elastic or yielding plate and rest plate or guide, placed at the lower end of the box or case—it being understood that I do not claim separately any of the parts, but the whole combined, as set forth.

84. BATHING APPARATUS; Frederick Kraemer, Brooklyn, New York.

Claim—The tub, constructed of two semi-cylindrical portions connected together, as shown, in connexion with the steps, supply cocks, and discharge valves.

85. MACHINES FOR CLEANING WHEAT; Jesse Lantz and John Russell, Wheeling, Virginia.

Claim—1st, The additional air tube or arch, F, in connexion with the air tube or arch, E, for the purpose of receiving the wheat through an aperture in pipe, F, above the hopper, V, and from the hopper, G. 2d, The adjustable reeded rubber, O, combined with the flanch rubber, I.

86. Rock Drills; Wm. Lewis, Harrisburgh, Pennsylvania.

Claim—1st, The combination of the peculiarly constructed lifting jaw, with the peculiarly constructed vibrating flexible frame and inclined planes, whether operated by a lever or other mechanical device. 2d, The peculiarly constructed vibrating flexible frame for holding the lifters together, and shifting them out of the way alternately 3d, The united use of the lever and strap for operating on the lifting jaw, inclined plane for turning the bar, and flexible vibrating frame, for throwing the jaw out of gear with the drill bar.

87. Machine for Coring and Quartering Apples; Charles Lounsberry, Jr., Nichols, New York.

Claim—The combination and arrangement of the knife with the movable step, the standard with its attachment, the cup and spring being substantially made as described.

88. Apparatus for Generating Gas; Henry Lyles, Washington City, D. C.

Claim—The peculiar arrangement of the perforated chamber as constructed with the retort, gauge cock, stop cock, and siphon pipe, when they are constructed in the manner specified.

89. Retorts for Distilling Oils from Coals; John and W. B. McCue, Freeport, Pennsylvania.

Claim—1st, The employment of the connecting pipe located in the retort in other than a central position, whereby we are enabled to conduct off the oleaginous products of the coal, while the said retort partially revolves backward and forward on its axis. 2d, Providing the retort with the longitudinal ribs, for the purpose of agitating the coal and preventing its sliding when the retort turns.

90. Machines for Fanning and Assorting Grain; R. Nutting, Randolph, Vermont.

Claim—1st, The arrangement of the screens for separating and assorting, when so combined with shoes, frames, and motive arrangement, that the grain, seeds, beans, &c., are required to pass over them in a sliding or rolling manner, and not caused or allowed to drop on their surface or fall thereupon vertically, or so as to strike an aperture endwise first. 2d, The hold-fast, substantially as described. 3d, The extra-screens box, substantially as described, in combination with the drawers. 4th, The percussion bar, substantially as described.

91. Counter Scales; H. B. Osgood, New Haven, Connecticut.

Claim—The method of bringing the pea to standard weight, and to enable it to indicate weight from scales on opposite sides of the beam, consisting of the adjustable pins, in combination with the pea, as described.

92. Escapement for Time-keepers; E. Paulus, Philadelphia, Pennsylvania.

Claim—The modification of the duplex escape wheel in compressing the upright row of cogs, the manner of giving the impulse directly by it with a pin jewel set in the main roller mounted on the balance axis: the detent with its fork, toothed for gearing with the pinion of the resting cylinder, and its particular arrangement on the escape wheel axis: the arrangement of the resting cylinder with its pinion; the particular disposition of the lifting roller acting in the fork; the new and more solid arrangement to hold the escapement without bridges, but with simple pillars supporting two small plates secured with pins or screws.

93. Bake Ovens; Wm. Pettet, City of New York.

Claim—1st, The arrangement and construction of an oven with two furnaces, the one being located on the exterior and the other on the interior of the oven, each communicating with the same series of flues, so that either one may be used at pleasure, whereby the heat may be retained within the oven, or diffused through the apartment. 2d, So constructing the interior of the described oven and its flues, that the entire lining may be removed for the purpose of clearing the flues, and replaced.

94. Printing Ink Rollers; Elisha Pratt, Salem, Massachusetts.

Claim—The employment of an alkali in the manufacture of inking rollers, in the manner set forth. Also, the use of rosin oil, rosin and shellac, in combination with the other materials employed, in the manner set forth.

95. Repeating Fire Arm; Franklin B. Prindle, New Haven, Connecticut.

Claim—The use of two charge tubes (one of which to contain the balls and the other the cartridges), in combination with the two chargers and ramrod, when constructed, arranged, and made to receive the charge and deposit it in the barrel simply by pulling the trigger. Also, the combination of the hammer and sectors with the chargers and ramrod (so that I may charge, cock, and fire by simply pulling the trigger), when the whole is constructed, arranged, and made to operate substantially as described.

96. Hay Elevators; E. M. Rees, Norristown, Pennsylvania.

I do not desire to claim, broadly, the locking of the frame to, and releasing it from, an elevating rod, as such a device is described and claimed in the patent granted to T. T. Jarrett, May 30, 1854. Neither do I desire to claim, broadly, a spring latch for releasing and retaining the frame. But I

Claim—The plate with its spring bolt and rod, in combination with the forked rod, with its upper end bent, as described, and its projection, I, when the several parts are constructed and arranged with respect to each other and to the frame, substantially as set forth.

97. Steam Valve; George Rieseck, Pittsburgh, Pennsylvania.

Claim—1st, The valve, D, with a projecting hollow stem, E, which is reduced so that its end presents an area only equal, or nearly so, to the ports, F, F1, F2, G, G1, G2, in combination with a main steam chest or chamber, J, and an auxiliary steam chest or casting, I, furnished with a stuffing-box, d, and constructed so as to cover the whole of the back of the valve excepting the end of the stem or a portion of the back equal, or nearly equal, to the ports in its face. 2d, In combination with the above, the peculiar manner specified of making the face of the valve, D, with six ports, F, F1, F2, G, G1, G2, three for receiving and three for exhausting, said ports being arranged in such relation to each other, that when the valve is applied to an oscillating engine, one receiving port always stands in a line with an exhaust port, and that only four of the ports shall be in use when the engine is working forward, and the extra two thus kept in reserve, so that the engine may be reversed on shifting the valve by the pressure of steam from a full open port.

98. Seeding Machines; T. R. Richmond, Massillon, Ohio.

Claim—The reciprocating slides, operated as shown, in combination with the caps and plates, the above parts being perforated and arranged as set forth.

99. Harrows; Jeremiah Routh and Abel Vaughn, Grayville, Illinois.

Claim—The combination of the vertical toothed wheel, D, with the horizontal toothed wheels, B B, said wheels being connected by gearing, as described, by which we secure the necessary rotation, without either side draft or dip of the horizontal wheels.

100. PRINTING PRESSES; C. Edward Sneider, City of New York.

Claim—1st, The revolving double segment frame with segments balancing each other, in combination with a rocking type bed, operated through the segment frames. 2d, The rocking type frame with eccentric ways attached, working over fixed rollers in the manner described. 3d, The arrangement and the manner of operating the distributing cylinder, supported between the segment frames upon the shaft to which the segment frames are attached, said cylinder being made to revolve in the opposite direction to the motion of the shaft, and having at the same time a side motion communicated to the said cylinder for the purpose of distributing the ink upon the inking rollers, in connexion with an arrangement of inking rollers, operated in the manner specified. 4th, The arrangement and construction of the fly-motion, in the manner described, operating in connexion with the nipper.

101. STEAM VALVES; Wm. J. Stevens, City of New York.

Claim—The slotted lever, F, the T-shaped lever, O, and the spring, K, arranged in relation with each other and with the piston rod and the valve stem, to operate substantially as set forth.

102. MACHINES FOR POUNDING RICE; John Tallon, New Orleans, Louisiana.

Claim—The combination of the pounder, arms, cross-head, connecting rod, and crank, arranged to operate in relation to each other, as shown.

103 FOLDING GRIDIRON; Joseph H. Thomas, Newark, New Jersey.

Claim—The application to a folding gridiron of the hinge joint, formed by the slotted stands and the projecting bearings on the ends of the back cross-bar, or their equivalents; the jointed handle and slotted standards, or their equivalents.

104. CEMENT FOR ROOFING PURPOSES; Joseph Thompson, North Wrentham, Massachusetts.

Claim—The composition, substantially as described, consisting of an alkaline silicate, oil or oils, coal tar, or pitch of coal tar, and naphtha (water being added when necessary), such being for the purpose or purposes set forth.

105. BILLIARD CUSHIONS; Wm. K. Winant, Brooklyn, New York.

Claim—The strip of steel, or equivalent material, inserted into the crease or incision in the india rubber cushion, substantially as specified. Also, the metallic bearing bar, between the back of the india rubber and the cushion rail, substantially as set forth.

106. VARIABLE BORING BIT; Wm. Tucker, Gloucester, Rhode Island.

Claim—The combination of a tapering centre point or screw centre, and an auxiliary cutter arranged on the shank, as described, with a main cutter applied to the shank, so as to be capable of being revolved thereon, and fixed in position thereon, by means substantially explained.

107. REDUCING WOOD FIBRES TO PAPER PULP; Henry Voelter, Heidenheim, Wurtemburg, Germany; patented in Wurtemburg, August 29th, 1856.

Claim—1st, The particular arrangement, construction, and combination of the machinery, or the mechanical expedients employed, as herein specified, for reducing blocks of wood, or producing wood pulp, by feeding them up automatically to a rotating grind or mill-stone, in connexion with the peculiar manner of applying or locating said blocks upon the circumference of the stone, or on a portion of its circumference, by holding them behind each other, in a position and direction essentially the same as described. 2d, The employment and the combination of a series of perforated and rotating cylinders with the reducing expedient, when contracted and connected between themselves, in the manner herein specified, by surrounding troughs and communicating channels or reservoirs, all made to operate as set forth, and for the purpose of assorting the fibres when separated from the wood in the modes described, rendering the pulp fit to be formed into paper of different qualities.

108. SEEDING MACHINES; S. R. Weldron, Winnebago Station, Illinois.

Claim—Dividing the hopper into two equal compartments, and using a slide to graduate the opening, a, between them, when the hopper, thus arranged, is used in combination with the rotating seed distributing wheels, flap or back board, and the double walls.

109. BEE-HIVES; Thomas H. Windle, Wagontown, Pennsylvania.

Claim—1st, The combined arrangement in the moth trap of the tapering moth tubes and the ventilated bee escape tubes, when the same are used in combination with the hive. 2d, Making each of the larger bee apartments with the self-cleaning slide, the said slide being conducted as described, and applied in connexion with the tongued piece, so as to operate substantially in the manner described.

110. MACHINERY FOR FORMING BATS FOR FELTING; Thomas B. Butler, Assignor to Lounsberry, Bissell & Co., Norwalk, Connecticut.

Claim—The arrangement of rows of teeth upon the calendar or felting roll, to hold the sliver while the vibration of the roll is changed, and the angle formed. Also, the rods, springs, pins, and cams, or their equivalents, arranged and operating as described.

111. STEAM ENGINES; John J. G. Collins, Assignor to self, Wm. A. Rhodes and Thomas Drake, Philadelphia, Pennsylvania.

Without claiming, broadly, the superheating of steam prior to its admission to the cylinder of a steam engine, I

Claim—Combining together for joint action, a cooler, regenerator, and steam engine, when the said regenerator is constructed and operated substantially in the manner set forth, and when it is furnished with the devices specified, or any equivalent to the same, by means of which it receives a supply of steam from the coolers, retains until it is superheated, and delivers it to the engine, at intervals regulated by the movements of the latter.

112. BURNERS FOR VAPOR LAMPS; Frederick Heidrick, Assignor to C. F. Clothier, Philadelphia, Penna.

Claim—The employment of the self-adjusting washer in connexion with the burner, button, and wick tube, in the manner set forth.

113. PLOUGHS; Joseph Jones, Assignor to Edmund Jones and Joseph Jones, Jr., Wilmington, Delaware.

Claim—The combination of the described gear and levers, when constructed and arranged for operation conjointly in the manner set forth.

114. TANNING HIDES; Theodore Klemm, Pfullingen of Reutlingen, near Stuttgart, Wurtemburg, Germany, Assignor to Edmund Moss, London, England.

Claim—The process of treating and impregnating hides, skins, and other animal tissues, by alternately

agitating them in a heated atmosphere or current of heated air, and rubbing or smearing them with the substances specified.

115. Gas Retorts; Alfred Marsh, Assignor to self, E. Hall Covell, J. Q. Dudley, and Robert Holmes, Detroit, Michigan.

Claim—In the construction of apparatus for the manufacturing of gas from resin or oils, the spiral column resting on feet with the flue through the centre; and also the apertures between the threads of the spiral column, in combination with the case, in the manner set forth.

116. Cultivators; Robert Sawyer, Wales, Assignor to Wm. G. Brown, Monmouth, Maine.

Claim—My improved weeding and hilling plough, constructed substantially as described, viz: with a coulter, a root cutter, adjustable cutters, and turning shares, applied to adjustable handles and a plough beam.

117. Cooking Stoves; John L. Stewart, Assignor to Randolph A. Nathurst, Nashville, Tennessee.

Claim—In connexion with the sunken recesses the use of flues or passages, substantially as set forth.

118. Folding Paper; John North, Middletown, Connecticut, Assignor to American Book and Paper Folding Co., Assignor to Anson Hardy, Assignor to Steuben T. Bacon, Boston, Massachusetts.

Claim—1st, Placing the sheet direct in register upon the knife to receive its first fold. 2d, Folding paper by means of a straight edge or knife and reciprocating rollers. 3d, Hanging the frame with reciprocating rollers and folding knife attached, to move and reciprocate in the arc of a circle. 4th, Causing the rollers to rotate and change their motion alternately. 5th, Cutting off the inset for the 12-mo folding, at the same time it is being folded.

119. Preparing Frames for Gilding; James W. Campbell, City of New York.

Claim—The inclined lathe, in combination with the inclined tool, when said tool is arranged substantially as shown, so as to be rendered capable of being adjusted to the frame, D, by the treadle frame, G, and at the same time allowed a lateral movement or play, to conform to any irregular movement of the frame due to an imperfect centering of the same on the plate of the lathe.

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120. Corn Shellers; Calvin Adams, Pittsburgh, Pennsylvania.

Claim—The combination of the pairs of adjustable and yielding wheels with the pairs of shelling wheels, when constructed in the manner described. Also, the manner of connecting the shafts with their respective cog-wheels, by means of the pivots and conical hub, or their equivalents, so that whilst they may revolve together, the shafts may play back and forth to adapt the feeding wheels to the various sizes of the ears of corn to be shelled.

121. Washing Machine; David Allan, St. Louis, Missouri.

Claim—The air chamber or concave top of dasher, or its equivalent.

122. Churn; James S. Appleton, White River Junction, Vermont.

Claim—Securing the churning vessel within a freely swinging frame, when the dasher of the churn is operated by means of a crank shaft, pitman, and vibrating beam.

123. Cross-cut Sawing Machine; John T. Armstrong, Jacksontown, Ohio.

Claim—The combination of the frame, A, wheel, E, and guide rod, F, with the frame, C, and carriage, L, and saw, I, when arranged in relation to each other, and operated in the manner set forth.

124. Railroad Car Seats; James M. Baird, Wheeling, Virginia.

Claim—1st, The oscillating pedestal and the vertical lever stay, in combination with the stationary seat stand, and the arrangement of the slats in each, by which to adjust the seat to any position required with the wheel, and also the arrangement by which the backs are changed, and held permanently to their places by the arm catch and the drop catch. 2d, The arrangement of the oscillating foot brace, in combination with a lady's foot-stool. 3d, The arrangement of the spittoon-holder.

125. Method of Securing the Cutters to the Spindles of Augers; Charles L. Barges, City of New York.

Claim—The combination of the spindle, cutter, and check nut, for the purpose of securing the cutter to the spindle.

126. Corn Planters; Thomas M. Bedgood, Cleveland, Indiana.

Claim—The combination of the truck wheel, cam wheel, lever, and gauge, when constructed and arranged in relation to each other and to the seed-box and spout, as described.

127. Machine for Sowing Fertilizers; Lyman Bickford, Macedon, New York.

Claim—A hopper bottom formed of sheet metal, or its equivalent, in which are arranged apertures, constructed as set forth, when combined with a series of vertical stirrers, slide or slides, arranged on the inner side of the bottom, in the manner described.

128. Ploughs; Wm. Black, Manchester, Pennsylvania.

Claim—The combining with the plough the adjustable rotary digger, having sharp teeth or picks, substantially as described.

129. Steam Heating Apparatus; Henry G. Bulkley, Kalamazoo, Michigan.

Claim—The surrounding of the air passages by a steam atmosphere, to which heat is applied after the steam is generated, for the purpose of increasing the temperature of the steam without high pressure, for making a rapid, safe, economical, and wholesome heat.

130. Mill Pick Holders; Jacob P. Brady, Mountjoy, Pennsylvania.

Claim—The double socket pick holder, when constructed as described, and used in combination with the diamond-shaped picks, in the manner set forth.

131. Corn Planters; John S. Davis, Arcadia, Ohio.

Claim—The adjustable guards, truck, and adjustable hoppers, in combination with the adjustable connecting rods, lever, and rod, the whole combined and operating in the manner described.

132. Brick Machines; J. W. Crary, New Orleans, Louisiana.

Claim—1st, The combination of an annular rim or concave moulding surface, with a roller or convex

pressing surface, so that the bricks are moulded by pressure operating toward the circumference, and discharged in a direction toward the axis of said concave moulding surface. 2d, Arranging a pug mill for the preparation of the dry clay, to work in connexion with said first feature of my invention, by means of the gearing described.

133. Operating Steam Trip-Hammers; Joseph S. Bonney, Hanson, and Charles W. Willard, Bridgewater, Massachusetts.

Claim—The arrangement and application of the parts, the same consisting not only in having a curved pendulous lever to extend from the hammer shank, or a projection therefrom, and play through and in the valve rod, as described, but in arranging and applying cams and adjustable bearers with respect to the said lever, and to operate together and produce a reciprocating motion of the lever.

134. Revolving Fire Arms; W. W. Elliott, Plattsburg, New York.

Claim—Extending the frame of the breech forward of the supporting point of the cutter pin, and placing in the part so extended the cock and trigger, when these devices are arranged in relation to the several revolving barrels, as specified. 2d, The arrangement of lever o, and trigger in advance of dog and ratchet, by which the barrels are revolved. 3d. The method of operating the cock by means of fly, the same being hinged at or near the centre of motion of the cock, and moving independently of the cock in one direction, but not in the other. 4th, The employment of wings when so constructed as to serve the double purpose of bracing the support of the centre pin, and of protecting the hands from injury by the discharge of gases and pieces of caps from the nipples, and being a portion of the frame of the breech, as set forth.

135. Pessaries; Wm. Elmer, M. D., City of New York.

Claim—Giving the peculiar form to the curved bar or tube, described and represented, and attached to its posterior or rear part a ring-shaped cup or inverted frustrum of a cone, in such relation thereto as to enable the instrument to perform the functions for which it is designed.

136. Metallic Bands for Binding Bales; Wm. Field, Providence, Rhode Island.

Claim—Arranging the band over the clasp, and the ends of the band which are bent nnder to form the loops by which the band is connected with the clasp, so that the ends lay above the clasp and the band covers and protects both of these ends, and also the clasp. 2d, Connecting the looped ends of the band with the clasp, by means of a double key, or its equivalent, so that the turning of the key prevents the loop from slipping. 3d, Arranging the key or keys on the under side of the band and clasp.

137. Stoves; Cornelius O. Foley, Troy, New York.

Claim—1st, The arrangement within the outer casting of the stove of the chambers, G D, descending and ascending flues, and exit pipe, with the open front cumbustion chamber, B, provided with the opening, F, as described, whereby what is known as the "Franklin stove" is made a good radiator without materially impeding its draft, as set forth. Also, the division plates, E, furnished with the opening, F, and constructed and arranged in combination with the chambers, G D, flues, smoke pipe, and fire chamber, B, in the stove.

138. Machinery for Preparing Oval Picture Frames; Wm. Gardner, City of New York.

Claim—A lathe with a face plate revolving in an oval path, in combination with a scraper adapted to the form of the desired moulding of the oval frame, when the said scraper is so arranged as to be self-adjusting laterally with the said moulding.

139. Lock; Fayette Gould, Huntington, New York.

Claim—1st, The rotating plate or boss placed within the annular ledge, and provided with a key chamber or recess and yielding or elastic pin, in combination with the sliding tumblers, notched or recessed as shown, the above parts being arranged substantially as set forth. 2d, The rotating plate or boss arranged with the sliding plate and tumblers, in combination with the check or guard tumblers.

140. Wrench; Francis D. Haywood, Walden, Massachusetts.

Claim—Combining with the head or upper jaw, when rigidly connected with its shank, a brace and screw arranged respectively on opposite sides of, and parallel with, the said shank, for the purposes of insuring true play of the slide or jaw, and of keeping the slide and head constantly parallel.

141. Machine for Cutting Mitres; Stephen W. Hall, Williamsport, Pennsylvania.

Claim—1st, The use in mitre machines of the flanches and the groove in the frame, for the purpose of guiding and sustaining the outer and inner edges of the knives, and preventing them from springing. 2d, The combination together of the flanches, the frame with the groove and sliding rest, substantially in the manner set forth.

142. Apparatus for Heating Mash Tubs; Adolph Hammer, City of New York.

Claim—The arrangement on the outside of the mash tun, described, and in combination therewith of a steam heater, in such a manner that any suitable quantities of the fluid extract of the malt may, at the discretion of the operator, be withdrawn from the tun through the said heater, so as to be warmed by the latter as it passes through the same to any suitable receiver provided for the purpose, that it may immediately afterward be returned into the tun for the purpose of raising the temperature of the mash therein to the degree required, as described; the said heater being connected with the interior of the tun, and the said pipes being provided with cocks.

143. Nail Plate Feeder; John W. Hoard and Thomas A. Searle, Providence, Rhode Island.

Claim—1st. The polygonal concave sided and oblique grooved feed bar, applied in combination with the pins on the feeding shaft, to produce the feed movement of said shaft by its own revolution, and to provide for variation in the feed. 2d, The arrangement of the feed bar, the driving shaft, and driving gear, and the plate, for throwing out the stop pawl of the running back mechanism in the same movable frame, which is liberated by a latch lever, actuated by the feeding shaft, and thus permitted to be operated upon by a spring, or its equivalent.

144. Mode of Securing and Adjusting the Steps of Mill Spindles; Gideon Hotchkiss, Windsor, New York.

Claim—The double fulcrum lever operating outside of the shell and over the base, resting on two raised fulcra on the shell fitted to said levers, and the suspending the sway bar and pot by means of sway bolts passing through said lever, in the manner described—also the flanches on the bottom of the pot. Also, the manner of supporting the regulating screw on an adjustable base or safety lightener, by which the stones can be quickly raised and returned again to the same position, in combination with the foregoing arrangement.

145. Reciprocating Sawing Machine for Sawing Plank; Wm. C. Huntington, Newark, New Jersey.

Claim—1st, Connecting the saw wheels to the cross-heads by pivots, when the saw is worked without a saw gate, and is strained and tightened by being attached to a tightening belt. 2d, The combination of the

cam-shaped feeding and retaining dogs, operating in opposite directions to each other with the flanched disk, for the purpose of communicating a feed motion to the lumber being sawed, and retaining the lumber firmly in place while the saw is cutting it.

146. CONSTRUCTION OF CANAL BOATS; Anson Judson, Unadilla, New York.

Claim—The wide openings in the bow and stern of the boat, extending to or near the full width of the boat, and as low as the bottom.

147. SMUT MACHINES; J. N. Lester, Oswego, New York.

Claim—The rotating conical plates attached to the hollow shaft, in combination with the stationary conical plates, rims, cylinder case, and fan, the plates being provided with scouring ledges, and the whole arranged relatively with the fan, induction spout, and blast spout.

148. BRIDGE; Stephen H. Long, Louisville, Kentucky.

Claim—1st, The combination of the suspension truss frame with the suspension arch or arches, or the arch stay. 2d, In combination with the truss frame, the auxiliary stays, arranged therein, as a means of strengthening and fortifying said truss frame, as stated.

149. AMALGAMATING GOLD AND SILVER; Samuel Longman, Brooklyn, New York.

Claim—Masticating or kneading, in the manner set forth, the dry metalliferous powder of the gold and silversmiths' sweeps, scraps, and polishings, or the native precious metals, when so prepared with quicksilver, when sprinkled with barely sufficient water to cause the mass to agglutinate.

150. ROCK DRILLS; W. W. Loomis and John Hewitt, St. Louis, Missouri.

Claim—The combination of the two grooved guide rods with the drill bar and the two pawls and nuts, whereby the two guide rods are allowed to fall with the drill bar, so as to keep the top and bottom guides always the same distance from the end of the drill bar.

151. EXCAVATING MACHINES; Wm. R. Maffett, Wilkesbarre, Pennsylvania.

Claim—1st, The arrangement of excavating implements on either end of the beam, in such manner that the weight of one scoop or implement is made to counterbalance and assist the other, the said beam being capable of moving longitudinally forward or backward, and of swinging to the right or left, or up or down, each motion being had separately or in combination, whereby the loading of one digging implement and the dumping of the other form part of the same operation. 2d, Constructing and arranging the toothed picker and scoop in such manner that they may be turned with respect to the beam. 3d, In combination with the arrangement for turning the scoop and picker on the beam, I claim attaching them so that they may separately be turned on their own axis, whereby the toothed picker may be made to perform the duty of both a digger and a rake, and the scoop that of a shovel and hoe or scraper.

152. REAPING MACHINES; C. W. and W. W. Marsh, Shabbona, Illinois.

Claim—The box or receptacle, I, platforms, J, M M, and box, K, provided with the hinged or adjustable bottom end piece, l p, when the above parts are used in connexion with the endless bands of rakes, D E, and arranged relatively with each other, as set forth.

153. FEED MOTION FOR CEROTYPOGRAPHY; John McElheran, Brooklyn, New York.

Claim—The manner described of causing the type, by their insertion in an adjustable type socket, or its equivalent, to regulate their own required position relatively to the impression surface.

154. LANTERN FOR BURNING COAL OIL; Max Miller, Brooklyn, New York

Claim—The inverted cup provided with the perforated band and placed over the lamp, the band encompassing the wick tube cap, in combination with the glass cylinder and the tube, or its equivalent.

155. STEERING APPARATUS; Franklin A. Morley, Sodus Point, New York.

Claim—The combination of gears and shafts, arranged for operating the rudders of vessels, and at the same time allow them ample room to traverse perpendicularly and vibrate slightly horizontally. And in combination with the above, I claim making the journals of the shaft longer than the boxes in which it turns, or elongating the hole in the box so the shaft can vibrate horizontally on both of these devices combined to accommodate the pinions, and make them act with the same power or force on each of the gears.

156 CARPET CLEANER; Augustus W. Noaey, Bridgeport, Connecticut.

Claim—The combination and arrangement of said flaps or drags, and the said shields, with the revolving cylinder brush, box, and dust-pan, in the manner described.

157. GRAIN DRILLS; Adam Pritz, Dayton, Ohio.

Claim—1st, The employment of a distributing slide which has two sets of different character of discharge passages, and a connecting rod having two adjusting notches, in combination with a set-screw which has a serrated sliding cap, and with a slotted actuating lever which has a serrated rib on its upper side. 2d, In combination with the above, the employment of short flanched metal tubes for securing the flanched gum or leather conducting tubes to the drill frame.

158. MACHINE FOR FORGING NAILS; S. S. Putnam, Boston, Massachusetts.

I do not limit my claims to machinery for any particular class of forging, but intend to apply them to forging machinery wherever they may be applicable.

Claim—1st, Hanging the springs which actuate the hammers at points independent of the pivots upon which the helves vibrate, and so far removed therefrom that they shall bear upon the helves nearer to the hammer faces, when the hammers are raised, than at the instant when the blow is given, as set forth. 2d, The spring, E, for actuating the hammers, in combination with the set plates, F, and screws, v, for regulating the tension of the same, as set forth. 3d, In combination with the hammers, A, and side pieces, H, I claim the adjusting checks, operating in the manner described. 4th, And in combination with a mechanical cut-off, I claim holding the hammers out of action and without the reach of the cutters whilst the nail is being cut off. 5th, Pivoting the lever to any adjustable block, for the purpose of regulating the motion of the nail rod, as set forth.

159. THRESHING MACHINES; Samuel D. Reynolds, Lane, Illinois.

Claim—Arranging a band cutting and stalk spreading cylinder, with the threshing cylinder of a threshing machine, substantially in the manner set forth.

160. REVOLVING FIRE ARM; Joseph Rider, Newark, Ohio.

Claim—1st, Combining the springs with the hammer, the rotating dog, and the peculiarly constructed notched trigger, by means of the reacher, constructed, applied, and operating substantially as described, to

make the single spring serve the purposes of main spring, dog spring, and trigger spring. 2d. The combination of the stop lever, l m, with the notched trigger and the reacher, by which the said stop is brought by the single spring, s, into operation on the cylinder as the cocking takes place.

161. WASHING MACHINE; D. C. Rood, Altona, Illinois.

Claim—Having the rotating cylinder provided with a flap or door, flap or fastening, and covered by an inflated band or belt or any suitable cloth or fabric, in combination with the yielding concave provided with the corrugated board and rollers, the whole being placed in a proper box, and arranged substantially as set forth.

162. SEED PLANTERS; Jonathan H. Rose, Versailles, Illinois.

Claim—The seed distributing device formed of the slide, bent or lowered, as shown, and the adjustable bar fitted in the seed box, the whole being arranged and connected with the plough for joint operation.

163. ANDIRON; J. B. Sargent, New Britain, Connecticut.

Claim—The construction and arrangement of the legs, the fire-iron, the pillar, all secured together by the bolt in the nut, in the upper portion of the pillar, all of which can be readily detached when desired.

164 BOMB LANCE; Rufus Sibley, Greenville, Connecticut.

Claim—1st. Uniting the front and base of the bomb or projectile by tubes or bars in skeleton, substantially as set forth. 2d, Confining the fuse in the fuse tube by drawing down the end of the tube upon the fuse after it is placed therein. 3d, In combination with the skeleton shank or connexion, the wings, whether used in pairs or singly, but so that they may be pressed down into and snugly fit the spaces between the skeleton ribs, tubes or bars, and be thrown out when the bomb is projected.

165. BUTTER BUCKET; J. W. Stimpson, Baltimore, Maryland.

Claim—The new article of manufacture, the same being the double walled butter bucket or kettle, constructed as set forth.

166. OPERATING CHURNS, &c.; Moses Swan, Potter Hill.

Claim—The arrangement of mechanism specified, for combining the churn tub with the wash tub, and giving the plunger and dasher of the same an up and down movement, and at the same time imparting a rotary motion to both tubs.

167. NAIL PLATE FEEDER; James H. Swett, Pittsburgh, Pennsylvania.

Claim—In combination with sleeve, E, and rod, F, the cam slots and pivoted switch for automatically turning said rod, first in one direction and then in the opposite one, for the purpose set forth. Also, giving the rod and nail plate a positive movement during the first of its forward motion by means of the crank, pitman, arms, cross-head, levers and their projecting portions, which are then forced apart by the cam wedge, and then releasing them by the action of the springs whilst in motion, so that their momentum will carry the nail plate up to the gauge. Also, in combination with the nail plate gripers, the spring dogs, for automatically opening said gripers to drop the end of the nail plate and be ready to receive another one. Also, in combination with the rod, F, and swinging plate, M, with its stud, the ledge, N, with its openings, for automatically throwing the feed within out of gear, when the nail plate is used up, and into gear again when a fresh plate is supplied. Also, in combination with the plate, M, the traversing projection for catching and drawing back said plate, when the nail plate is used up.

168. COMBINATION SHOE TOOL; D. J. Tapley, Danvers, Massachusetts.

Claim—The combination and arrangement of the "tack hole stamp," "last hook," and "peg cutter."

169. SEWING MACHINES; Wm. P. Uhlinger, Philadelphia, Pennsylvania; ante-dated May 3, 1858.

Claim—The vibrating finger, in combination with the needle and looper, arranged and operating substantially as described.

170. MACHINES FOR DIGGING POTATOES; Alex. Wells, Brooklyn, New York.

Claim—The rotating spirally flanched diggers in connexion with the clearers, arranged for joint action.

171. MACHINES FOR DIGGING POTATOES; Luke White, Essex, Vermont.

Claim—The combination of wheel, c, having buckets on the outer edge thereof, with wheels, d, and separator, e.

172. PRINTING PRESSES; Daniel Wolfe, Dixon, Ohio.

Claim—The self-emptying spring friskets arranged with the springing frames, in the manner set forth, and these in arrangement with the stationary bed plate, falling platen frame, bars, and lever, when all are combined and constructed in the manner set forth.

173. GRAIN SEPARATORS; L. Wilcox, Hudson, Michigan.

Claim—1st, The reciprocating feeder bar provided with projections placed at the bottom of the hopper, and attached to the shoe. 2d, The two sets of screens placed within one and the same shoe, and arranged relatively with each other and the hopper. 3d, Giving the screens a vibratory movement independent of the shake motion of the shoe through the medium of the rods, m m, screens, H, and rod, O. 4th, The screen attached to the shoe by the rods, m n, provided with the bars, s, and the rock bar, O.

174. GAS BURNERS; Wm. Wright, St. Louis, Missouri.

Claim—The adjustable valve, in combination with the chamber in which the said valve seats and the adjusting nut around the said valve, whereby the joint is made tight in any given position for the purpose specified.

175. SEWING MACHINES; J. S. Buell and W. T. Barnes, Assignors to J. Forsyth, R. D. Rockwell, V. M. Rice, and W. T. Barnes, Buffalo, New York.

Claim—1st, The arrangement of the springs with the feeder bar and feeder, each operating in the manner specified. 2d, The looping apparatus, composed of the frame work, the spear, the hooks, and the guide, operating substantially in the manner described.

176. CLOTHES' HORSE; E. Culver, Jr., Assignor to self and S. M. Blackwell, Shelburne Falls, Massachusetts.

Claim—The combination of the panels, B, panels, C, and connecting links, l l′, with a self-supporting pedestal, the whole arranged to operate as described.

177. CHUCK FOR LATHES; Simeon Goodfellow, Assignor to self and John Fish, Troy, New York.

Claim—The button or stop attached to the slide and arranged relatively with the jaw, for the purpose

specified. Further, adjusting the frame by means of the screw, when said frame is arranged with the jaws and screws, whereby the chuck may be used either as an eccentric or concentric one, and manipulated with equal facility in either capacity.

178. CARPET SWEEPER; H. H. Herrick, Assignor to Lafayette Culver, East Boston, Massachusetts.

Claim—1st, Inclining or grooving the brush shaft as at o and k, as described. 2d, Protecting the bearings from dust by means of the plates, operating in the manner described. 3d, The peculiar construction of the dust pan, with its spring lip, in combination with the screen, operating as set forth. 4th, Dividing the brush in the centre and connecting each half with one of the driving wheels, as set forth, in combination with the method described of pivoting the inner ends to a suspended support, whereby the continuity of the brush is not interrupted.

179. SEWING MACHINES; T. D. Jackson, Assignor to Joseph W. Bartlett, City of New York.

Claim—A swinging thread guide attached to the cloth presser, and operated by, and in combination with, an oscillating hooked or barbed needle, constructed substantially as described, whereby I am enabled to secure the taking of every stitch, and render a single thread machine effectual.

180. STEAM VALVES; Wm. S. Mackintosh and Samuel Wadsworth, Assignors to Cridge, Wadsworth & Co., Pittsburgh, Pennsylvania.

Claim—The arrangement of three hollow valves with their stems and ports, and the passages in the valve box, in the manner set forth.

181. ADDOMETERS; L. N. Nutz, Alton, Assignor to I. B. Randle and E. Hibbard, Madison Co., Illinois.

Claim—The feathered shaft, when combined and arranged with a series of indicators and a set of keys, substantially as described, for the purpose of enabling the operator to add up and register any number of columns of figures in succession by means of the same set of keys.

182. STEAM COCK; J. L. Winslow, Westbrook, Assignor to J. N. Winslow, Portland, Maine.

Claim—Arranging the operating screws at the foot of the plug and its case, so as to be capable of being rotated therein, without at the same time having any longitudinal motion. Also, making the spindle separate from the plug, and combining with them and the case the bearing shoulder and the clutch connexion.

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183. MACHINERY FOR MAKING ROPE; Newton Adams, Lansingburg, New York.

Claim—The combination of a revolving flyer containing a capstan and reel, with the revolving strand flyers revolving around the laying spindle, producing and controlling the rotary motion of the strand spindles or flyers on their own axis, by means of the stationary or moving belt, acting on pulleys on the said spindles or flyers, the pulleys, worm wheel, and stationary or moving endless screw.

184. VAPOR LAMP BURNERS; Solomon Andrews, Perth Amboy, New Jersey.

Claim—1st, The combination of the wick tube, the gas chamber, and the caloric conductors in a gas lamp, as described. 2d, A cotton or other fibrous wick made hollow by a wire gauze tube, or its equivalent.

185. LATHE FOR TURNING BEADED WORK; Frederick Baldwin, South Wardsboro', Vermont.

Claim—1st, The stationary mandrel provided with the movable or adjustable dies and spurs, rotating cutter disks, provided respectively with the cutters, the feeding nut, and the rotating pattern actuating the cutter, through the medium of rod, collars, and plate. 2d, The guide and wheel provided with the stop pin, l, pin, o, and bar, n, in connexion with the slides connected by the spring, the lever, clutch, and collars, provided with the pins. 3d, The feeding nut placed in the cutter disk, in combination with the stationary mandrel and cutter disk.

186. RAILROAD RAILS; Sidney A. Beers, Brooklyn, New York.

Claim—The construction of cast or other iron rails, as set forth, when combined in their formation with the lugs or cleats, as shown, for the purpose of receiving a flat iron plate or wedge for securing the ends of the rails evenly together, and giving the rail additional strength at the point of connexion.

187. SPINNING MULES; James H. Brickill, Taunton, Massachusetts.

Claim—1st, Arranging the winding gear loose on a stationary bushing, or its equivalent, which surrounds and forms one of the bearings of the winding shaft, and applying a pawl attached to said gear, a spring fitted to the bushing to engage the gear with a ratchet wheel, fast winding shaft, in the manner described, whereby the winding shaft and winding gear are permitted to be entirely disconnected during the operation of backing off. 2d, The combination of the adjustable cam on the rock shaft, the loose pulley, working on the stationary bushing, or its equivalent, surrounding the winding shaft, the pawl on said pulley, the clipspring on the bushing, and the ratchet wheel on the winding shaft, to effect the backing off of the yarns—and in combination with the pawl, I claim the pin applied to disengage said pawl, and permit the reversal of the shaft to wind on the yarns. 3d, The combination of the brake wheel on the winding shaft, the brake and the tooth on the belt shipper, for the purpose of stopping or reducing the momentum of the winding shaft previous to the operation of backing off.

188. ADDOMETER; Jabez Burns, City of New York.

Claim—1st, The toothed wheels, when arranged in the particular manner described, relatively to the arc index plates, in combination with the toothed wheels of the registering cylinders and stop. 2d, The particular arrangement, in combination with the above, of pins, on the sides of the finger wheels, toothed segments, and pins, c, on the sides of the registering cylinders.

189. COUPLING FOR RAILROAD CARS; Jesse Campbell, V. B. Leghtiser, and Patrick Shannon, Steubenville, Ohio.

Claim—The link, made rounding at the point, with square offsets on each side, in combination with the jaws, the spring, chain, and hand wheel, or its equivalent.

190. APPARATUS FOR COOLING AND VENTILATING GRAIN; Charles D. Clark, Chicago, Illinois.

Claim—The arrangement of cylinder provided with rectangular grates and the blast pipe, A, and separating cone, operating in connexion with the blast through the pipe, E.

191. ROOFING COMPOSITIONS; Abram Davis, Chicago, Illinois.

Claim—The method of applying a cement having the composition set forth, namely, by first saturating canvass, or other suitable fabric for roofing, with asphaltum, softened and tempered with crude kerosene oil, or its equivalent, in the manner mentioned, and secondly, by covering this layer or foundation with a cement formed of india rubber and other ingredients.

192. Carpenters' Work-Bench; Justin Devoge, Randolph, Pennsylvania.

Claim—1st, In regulating the inclination of the cutting instrument to the angle required, to give the edge of a board a given bevel by raising or lowering one of the jaws of the clamp between which the board is held, substantially as described. 2d, The combination of the bevel boards, arranged as described, with the jaws of the clamp.

193. Quartz Crushers; A. J. Doolittle, Nevada Township, California.

Claim—Arranging the stampers of a quartz crusher in such a manner that they are guided in their up-and-down motion by two springs, which at the same time serve to increase the force of the blow, in combination with the pans which are placed loosely under the stampers, so that they are free to rotate under the action of the blows, and which have openings in their sides, the size of which is different for different pans, and depends upon the relative coarseness of the quartz, so that the finer parts of the quartz escape, and the coarser ones are continually exposed to the full force of the blows, the whole being arranged substantially as set forth.

194. Writing Desks; John W. Fiester, New Lexington, Ohio.

Claim—The arrangement of rollers with coiled springs attached, with the horizontal cords on pulley, the canvass arranged on the rollers and scales, and the hand board hinged to the desk.

195. Sewing Machines; R. B. Fitts and Milton D. Whipple, Charlestown, Massachusetts.

Claim—1st, The "keel guide" beneath the pressure foot, operating as set forth. 2d, Causing the shank of the needle to play vertically in guides, and connecting the pitman directly thereto, as described. 3d, Securing the needle in place by means of the pin, when its shank is provided with a notch to insure its proper position with respect to the hook and the table. 4th, The peculiar arrangement of the bar and its post, with the bent lever, and sliding plate, and spring.

196. Car Seats and Couches; I. N. Forester, Fairfax Court House, Virginia.

Claim—1st, Combining with car seats an auxiliary back and bottom, which are adjustable, said auxiliary back and bottom, being arranged as set forth. 2d, The ratchet teeth and spring pawls, combined and arranged in the manner set forth.

197. Seeding Machines; Joseph Fowler and F. M. Bacon, Ripon, Wisconsin.

Claim—The combination of the rotary perforated cylinder, E, board, H, and toothed bars, I, arranged for joint action, as described.

198. Cartridge for Fire Arms; Edwin Gomez and Wm. Mills, City of New York.

Claim—The manner specified of forming cartridges for fire arms, and other purposes, by alternate layers of explosive material and paper, or similar substance, for the purposes. Also, the winding of string, or equivalent material, attaching the case to the base of the ball, for the purpose of removing said case and any refuse matter from the barrel.

199. Machines for Cutting up Cornstalks in the Field; Francis M. Green, Sullivan, Illinois.

Claim—The knife cylinder constructed and operating as described, in combination with the supporting wheels and the mechanism for operating the same.

200. Portable Field Fence; John B. Johnson, Linden, Indiana.

Claim—The mode of locking the panels at the top, so as to prevent their being drawn apart longitudinally or endwise; and also the mode of locking the panels at the bottom, so as to prevent them from being pushed or slipped by one another, when the parts are arranged in relation to each other, as set forth.

201. Cross-cut Sawing Machine; Albert Heth and Gaylon Hall, Adams' Centre, New York.

Claim—The lever and oscillating platform connected by the rods, and attached to the saw bar or beam, J, by the pendant, the above parts being used in connexion with the beam, A, and cross-bar, B.

202. Metallic Spring; James Harrison, Jr., City of New York.

Claim—The coiled spring described, having the several revolutions of the coil approximating to the form of cones, or in other words, having the sides of its several coils inclined to the axis thereof.

203. Seeding Machines; Paul Hildreth, Beloit, Wisconsin.

Claim—The arrangement of the cone or graduated pulleys and the feed auger, in connexion with the revolving distributing cylinder and the distributing adjustable feeder.

204. Sewing Machines; Elias Howe, Jr., Brooklyn, New York.

Having described my invention, and the manner in which I have deemed best for embodying it in mechanism, I wish to be understood that it is not limited to the precise construction described, but that it may be modified as circumstances may render expedient to adapt it to different sewing machines, or to meet the views of different constructors. Thus, for example, if a curved shuttle race is employed, as is the case in some machines, the arm, F, may be pivoted at the centre of the circle of which the race is an arc, and its extremity may terminate in the recess at the butt of the shuttle, thus driving the latter directly without the interposition of the connecting bar or driver, D. I am aware that the shuttle of a sewing machine has been operated by seizing by one of its ends in a forceps; but the construction and operation of the mechanism in this case is such as to render it necessary to apply the driving apparatus to the shuttle, and to disconnect it therefrom at each movement of the shuttle. I do not, therefore, claim imparting motion to a reciprocating shuttle by seizing one of its ends intermittently by a forceps. But I

Claim—Imparting a reciprocating movement to the shuttle of a sewing machine by the application of a driver to one point only of its length, substantially as set forth, in such manner that the driver need not be disconnected from the shuttle. Also, constructing the shuttle driver in such manner that it is guided by a race parallel with the shuttle race, or its equivalent, and is at the same time supported and prevented from sinking out of its proper position by pivoting its stock perpendicularly to the table of the machine, in a socket in the arm which imparts motion to it, substantially as set forth.

205. Running Gear for Railroad Cars; James Ingersoll, Grafton, Ohio.

Claim—1st, The manner described of constructing the rollers with long or short axles, so that they shall extend down along the sides of the rails of the railroad, and the axles rest upon said rails. 2d, The employment of an internally toothed endless chain and an externally toothed driving wheel, in combination with an endless ellipsoidal guide way, and an endless series of rollers.

206. Washing Machines; Wm. A. Jordan, Thibodeaux, Louisiana.

Claim—The combination of the tube, C, slotted shaft, F, and pin or key, G, attached respectively to the tub, A, and disk or rubber, U.

207. Music Stool; Edwin Leach, Norwich, Connecticut.

Claim—The rods, annular or serpentine base, boss, nut, and screw, when arranged substantially as shown.

208. Bed Bottom; Rufus Leavitt, Cambridge, Massachusetts.

Claim—The construction of an elastic bed bottom, by means of a series of springs, constructed substantially in the manner described.

209. Machines for Breaking Hemp; Samuel H. Little, St. Louis, Missouri.

Claim—In combination with the main beating cylinder rotating in a fixed vertical plane on the permanent frame of the machine, the arranging of the feeding apron, breaking and crushing rollers, and concave in a second frame adjustable on the first one, so that when it becomes necessary to adjust the concave to the beater cylinder, the parts preceding the concave in the operation shall always maintain the same relative positions to it and to each other, as set forth. Also, the arrangement and operation of the beater cylinder, the concave, the reel, and carrying apron, all as described.

210. Rotary Harrows; Wm. H. Main, Liverpool, Ohio.

Claim—The manner described of causing a harrow to rotate, namely, by means of the standard, the slot in the bar, and spring. Also, the manner of raising the harrow from the ground by means of the adjustable bar and recesses. These several devices, combined as described, I claim in combination with a seeding machine.

211. Rails for Switching Cars off the Track; John C. Mather, City of New York.

Claim—Providing the shoe with two frogs, in the manner set forth.

212. Harnesses; Freedom Monroe, Romeo, Michigan.

Claim—The combination of the rigid bow whiffle-trees with the front coupling bar or tree, connected by swivel joints, said bows having hooks or other appliances for connecting the ends with an ordinary plough harness, operating in connexion with the central draft bar or chain.

213. Horse Rakes; Mirrick Morgan, Lancaster, Pennsylvania.

Claim—The arrangement of the axle and clearers with teeth, having curved ends, hinges, and roller, constructed for joint operation.

214. Harrows; Daniel B. Neal, Mount Gilead, Ohio.

Claim—The arrangement of the troughs, B and C, (one oscillating and adjustable, the other being stationary, and both provided with balls,) with a revolving harrow.

215. Ice Stand; Henry A. Roberts, Hartford, Connecticut.

Claim—An ice stand, with convoluted angular shape drip supports arranged in an adjustable frame, with the cross channel, flexible discharging tube, and rollers.

216. Elastic Fabrics; John W. Newell, New Brunswick, New Jersey.

Claim—An elastic fabric formed by the application of an elastic gum to the side of braid.

217. Ovens; E. Graves Otis, Yonkers, New York.

Claim—1st, The construction of ovens with the floor upon which the baking takes place running spirally around the inside of the oven. 2d, The rotary cylinder arranged and operating substantially as set forth. 3d, Placing the spiral chamber in which the baking is performed in communication with the hot air chamber, W, above the fire chamber, by means of the chambers, G, and the openings controlled by the dampers, for the purpose of regulating the temperature in the several portions of the said spiral chamber.

218. Metallic Bands or Ties for Bales, &c.; Increase C. Plant, Macon, Georgia.

Claim—The bale tie or lock made open at one edge and both ends, so that the band may be inserted in it edgewise, in the manner described.

219. Seeding Machines; D. B. Keiper and A. C. Fox, Texana, Texas.

Claim—The combination of the endless band, oscillating arms, and adjustable plate, arranged relatively with each other as shown, whereby the seed is properly agitated and kept, when reduced within the box, within the reach or path of oscillation of the arms.

220. Packages for Dry Goods; Alexander Robertson, Upper Holloway, Middlesex Co., England; patented in England, June 26, 1855.

I do not intend to confine myself to any particular kind or description of wood, although I prefer wood of close grain and texture, and in some instances I line or cover the inside of the package with tin foil or paper.

Claim—The new manufacture and process and method of manufacture of packages for dry goods, by the combination of wood and iron, or other metal, and constructed and made in manner described.

221. Steam Cock; Robert Ross and Willard Holland, Philadelphia, Pennsylvania.

Claim—1st, The loose valve plug fitted to the seats above and below, as set forth. 2d, In combination with the loose valve plug and the shoulder on the stem, the nut with its plane and concave faces, as described. 3d, The projecting stem passing through the loose valve plug, and fixed fast to the guides, as set forth. 4th, In combination with the valve stem, the upper spring valve, as set forth.

222. Machinery for Bolting Flour; Benjamin D. Sanders, Holliday's Cove, Virginia.

Claim—Depriving superfine flour of fine offal or impurities by re-bolting it, after escape from the head of the first reel in or by a second reel, apart from the main body of meal or coarse meal and coarse offal in the first reel. Also, re-bolting the coarser grades of fine offal and material admixed therewith, passing off at the tail end of the second reel, by or in a third reel, for restoring to the superfine flour that which belongs to it, and for the more perfect separation, without waste, of impurities therefrom.

223. Harpoon Lance; Nathan Scholfield, Newark, Connecticut.

Claim—1st, The several modes described of applying the sliding and extension cases, either with or without spurs, on the anterior part of a cylindric projectile, so as to extend either wholly or partially without the bore of the gun before its discharge, and while the projectile is in its position therein. 2d, Attaching the ring or collar holding the line of a harpoon lance to be fired from a gun to the rear end of a sliding case, with or without spurs, and on which a portion of the said line may be coiled if desired, preparatory to being projected. 3d, Connecting a lance head and shank of a harpoon lance to be fired from a gun to a cylindrical shell by a sliding socket joint, so that when forced in, or in place, the joint shall remain rigid and inactive, but when drawn or forced out, it shall be susceptible of flexibility by turning on its pivot.

224. Bolt Machine; Elisha Simkins, Allegheny, Pennsylvania.

Claim—1st, The flexible connecting rod and the arrangement of the cylinder, the spiral springs and nuts, as described. 2d, The arrangement of the lever, the ratchet wheel, the lever wheels, the screw, and the cross-head, when used in connexion with the flexible connecting rod, as described. 3d, The arrangement of the compound lever and the pulleys in connexion with the lever and stop, as described. 4th, The arrangement of the stud, the stop, the levers, and the bolster, as described.

225. Windlass; Samuel N. Smith, City of New York.

Claim—The lever, L, provided with the rack, K, which gears into the rack, J, in connexion with the rods, M M, and levers, N N, connected by the links, O, with the arms, I I, of the boxes, H H.

226. Gas Regulators; W. G. Sterling, Bridgeport, Connecticut.

Claim—1st, The described adjustable conical-shaped valve seat with its cross-bar, or its equivalent, and valve attached. 2d, The set-screw, in combination with the valve seat, or any other construction substantially the same. 3d, The combination of the movable valve seat, valve, and cross-bar, attached in any form or manner to a gasometer, disk, diaphragm, or other device, by which said regulator can be cleansed without the least derangement to the machine, as described, or in any other form or way equivalent thereto.

227. Escape; Owen Sweeney, Brooklyn, New York.

Claim—The drum with rope attached, brake, and compensating spring, and vibrating or tilting platform or board placed within the box, combined and arranged to operate as set forth. Also, the particular arrangement of the rock bar, pawl, platform or board, and strap or brake, as shown, whereby the person that descends solely by his own gravity releases the drum from the brake, and causes the car or basket to ascend, and also by the same means regulates for his descent the pressure of the brake on the drum, as described.

228. Water Metre; Franklin A. Tenney, Concord, New Hampshire.

Claim—The arrangement of the shifting weight, the spring valves, and the pins, or the equivalent of said parts, with the double chambered vessel.

229. Apparatus Attached to Steam Coils in Vats; John Frageser, City of New York.

Claim—Providing ratchets in the peripheries of the couplings and pawls, attached to the stationary supply and escape pipes, to prevent the working loose of the coupled joints by the swinging of the coil.

230. Composition for Miniature Cases, &c.; Mark Tomlinson, Birmingham, Connecticut.

Claim—The composition for useful and ornamental articles, made of shellac, Breckenridge or Cannel coal, and ivory black, in about the proportions and in the manner substantially as set forth.

[Note.—This composition consists of equal parts, by weight, of shellac, Breckenridge or Cannel coal, and ivory black. The shellac and Cannel coal are first finely pulverized, separately, and the three ingredients are then well mixed together, and fed between a pair of steam heated rollers, and one of which rotates at a higher velocity than the other, and thereby ground into a pasty mass, which, while still hot and plastic, is cut or divided by a spatula or other instrument into cakes of sufficient size to form the articles or pieces to be made. These pieces are laid upon a plate or tray, and placed in an oven heated by steam or other agency, and allowed to remain therein a short time, after which they are taken out, and while still hot are placed in steam heated dies of the requisite form to produce the articles or forms desired, and therein subjected to a heavy pressure. The pieces or articles are then allowed to cool in the dies to a degree sufficient to enable them to be taken out without any danger of bending, or otherwise injuring their form.]

231. Tempering Wire and Steel; Henry Waterman, Brooklyn, New York.

Claim—The process of hardening steel wire or thin steel in long sections, being kept under a longitudinal strain by means of the wheels, while passing through the fire in the furnace, the guide to conduct the wire directly from the fire unto the hardening bath, in combination with such hardening bath, as specified.

232. Corn Planters; Horace Whitman, Kingsville, Ohio.

Claim—The adjustable or articulating frame hinged to the machine, and provided with teeth and blades, in combination with the rock shaft, weighted lever, and lever, when arranged in relation to a seeding machine, substantially in the manner specified.

233. Corn Shelling Machines; Loren J. Wicks, Racine, Wisconsin.

Claim—The employment of the screen in the apron, in connexion with the tube provided with valves and grating, when the several parts are constructed and arranged with respect to each other and to the shelling wheel and cylinders, and operated conjointly therewith.

234. Attachments to Artificial Legs; Oliver David Wilcox, Elmira, New York.

Claim—Providing for the adjustment of the sack by means of straps and buckles applied substantially as described.

[Note.—This invention consists, firstly, in a certain system of levers connecting the leg with the thigh piece and foot, for the purpose of controlling the proper operations of the leg and foot in walking. Also, in the employment of a spring to give elasticity to the ancle joint. Further, in providing for the adjustment of the sack, which the inventor patented September 30, 1855, to adapt it to the condition of the stump, by means of straps and buckles.]

235. Locomotive Engines; Ross Winans, Baltimore, Maryland.

Claim—The combination with the smoke box of a locomotive steam engine of a blast pipe extending from within the lower end of the chimney downwards to near the lower flues, an annular space between the upper end of the blast pipe and the chimney, a diaphragm near the lower end of the blast pipe and between the latter and the bottom of the smoke box, and a nozzle directing a jet of steam into the plast pipe, the several elements of the combination being arranged and operating substantially as described. Also, the construction of the diaphragm with its upper surface sloping towards the exhaust nozzle, to cause the coals and cinders to run down by their own gravity beneath the blast pipe, thereby bringing them within the sweep of the draft, and so rendering their discharge more speedy and more certain.

236. Obstetrical Chairs; C. C. Wings, Newport, Virginia.

Claim—Passing the strap or cord through the standard of the portable chair, at a point on a level, or nearly so, with the pad and the cord around a pulley in the back of the chair, and a little above the seat of the same, so that the operation of the straps or cords will be in the direction in which the support is most needed, and the counter pressure, produced by the action of the two pads, may have the fullest effect. Also, the adjustable hand slats and the foot pieces, when arranged and combined with a portable chair.

237. Machine for Setting the Staples in Blind Slats; James Wyman, Schaghticoke, New York.

Claim—1st, The arrangement and combination of the vertically sliding punch, spring supporting and

stop bar, spring feeding slide, and grooved sliding bar or anvil. 2d, In combination with the above, the ratchet teeth of the sliding bar or anvil, dog, spring pawl, and adjustable gauge plate.

238. Lock; Hjalmar Wynblad, West Hoboken, New Jersey.

Claim—The arrangement of tumblers provided with cogs and notches in connexion with a projection on the bolt, and operating in the manner described.

239. Water Closet; Isaac Edelman, Assignor to G. W. Edelman, Philadelphia, Pennsylvania.

Claim—The casing, pipe, soil pipe, and exterior pipe, when arranged with respect to each other, and when communicating with a ventilating pipe or flue.

240. Valve Gear of Steam Engines; James Ferguson, Assignor to self and Lazell, Perkins & Co., Bridgewater, Massachusetts.

Claim—The employment of cams, of the form specified, applied in the manner described, to connect the valve stems with the rock shafts, which receive the tripping motion.

241. Chain Stopper; Wm. H. Gray, Dover, New Hampshire, Assignor to self and A. G. Brown, Salem, Mass.

Claim—Hanging the butt of the pawl on bossings cast on the inside of the two supporting standards or ears, in combination with the shoulders, h h, on said pawl bearing against said standards, as described.

242. Apparatus for Broiling, Toasting, &c.; H. W. Harkness and W. A. Terry, Assignor to selves and Joseph Sigourney, Bristol, Connecticut.

Claim—The described broiling and toasting apparatus, consisting of case, clock movements, arms, spindle, pins, arranged and operating substantially in the manner set forth.

243. Anchor Ball; H. W. Harkness, Bristol, Assignor to self and J. W. Bliss, Hartford, Connecticut.

Claim—An anchor ball with flukes, springs, grooves, and staple, substantially in the manner described.

244. Sewing Machines; T. D. Jackson, Assignor to J. W. Bartlett, City of New York.

Claim—1st, The employment of a yielding roller, constructed for the purpose of closing the barb of the needle during its movements, substantially as set forth. 2d, And in combination with a yielding roller, the swinging thread guide to carry the thread in position for the needle to insure the stitch.

245. Cut-off Valves of Steam Engines; John Jackman, Jr., Newburyport, Assignor to self and E. H. Ashcroft, Boston, Massachusetts.

Claim—The combination of the levers and the collar, as arranged and applied to the rod of the ball governor, and to the slide rod of the inclined plane.

246. Horse Collar Blocks; B. W. McClure and George Marsh, Assignors to B. W. McClure and I. H. Windsor, Pike Hollow, New York.

Claim—The peculiar arrangement of the mould block and rim setter with the cord and stretcher, when combined in the manner set forth.

247. Trap for Animals; Frederick Renthe, Assignor to M. Lath, Hartford, Connecticut.

Claim—The notched curved yoke, and the application and combination of the various parts to form a rat trap, in the manner described.

248. Carpet Stretcher; Henry Ridley, Assignor to S. P. Thatcher and Walter Stillman, Hartford, Conn.

Claim—The construction and arrangement of the clamps, strap, wheel, ratchet, pawl, in the frame work, substantially as described.

249. Burnishing Machine; L. S. White, Assignor to E. W. Sperry, E. Hurlbut, and J. H. Ashmead, Hartford, Connecticut.

I have described this machine as specially adapted for burnishing spoons, oval handles, &c. It will readily be seen and understood that variations must be made for different kinds of ware, also that the same motion may be produced by different device. I do not therefore wish to confine myself to the particular way or mode of operating, as described, as, for instance, the revolving motion of the jack may be produced by arms, levers, &c., instead of gear.

Claim—The holding or rolling jacks, and the oscillating or vibrating stock, substantially in the manner described.

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250. Coupling for Bale Hoops; John Agnew, Columbia, South Carolina.

Claim—The socket provided with the double taper opening in connexion with the loops at the ends of the hoops.

251. Hillside Ploughs; H. S. Akins, Speedsville, New York.

Claim—1st, The reversible mould-board and coulter, in combination with a reversible clevis, in the manner described. 2d, Attaching the hook to the lever which operates the coulter, thereby making the operation of reversing the hook, adjusting the coulter, and fastening both the mould-board and coulter in their respective positions by one and the same hook, and at one operation. 3d. The reversible chain clevis, for the purpose of producing reversible side draft, when connected in the manner described.

252. Machine for Cleaning Hose, &c.; John B. Alden, Jr., and E. L. Gates, Worcester, Massachusetts.

Claim—The combination and arrangement of the brushes, one or both of which is movable to and from the other during operation, and the rolls, when constructed in the manner described.

253. Cotton Seed Planters; H. P. Allen, Bowling Green, Kentucky.

Claim—1st, The combination of the hook when arranged to reciprocate with rotating hopper. 2d, The tangentially set shelves when slotted and used on the inner circumference of a rotating hopper, which has a continuous discharge passage.

254. Removing Sparks from the Smoke Stacks of Locomotive Engines; Jacob A. Alter, Johnstown, Pa.

Claim—A scraper, constructed and arranged so as to scrape such parts of the spark arrester, smoke stack, and chimney of locomotive engines, and other furnaces, as require cleaning, and clean them of the soot and sparks. Also, in combination with the said scraper, a ratchet wheel and pawl, or such equivalent device as will enable the fireman to operate said scraper by hand, or connect it to some part of the engine so that it will be operated by it. Also, the pipe or spout for conducting the soot and sparks from the spark arrester or smoke stack, substantially as described.

255. Sewing Machines; Solomon Andrews, Perth Amboy, New Jersey.

Claim—The combination of the wedge and lever piece, and feeding foot, constructed in the manner as described.

256. Securing Plane Irons to the Stocks of Bench Planes; Leonard Bailey, Winchester, Massachusetts.

Claim—The application and arrangement of one or more bearers, the clamp lever, and the thumb cam, together and with respect to the top surface of the plane iron and the bearing surface or cutter seat of the throat.

257. Looms for Weaving Skirt Fringe; James Beck, City of New York.

Claim—The employment of shears in combination with the rod around which the fringe threads are carried, for the purpose of cutting the said threads on the rod.

258. Umbrellas; Charles Boernicke, Baltimore, Maryland.

Claim—Constructing a pocket umbrella, consisting of rods, D, joint lever, collar piece, rod, C, with projection stick provided with disks, and lever with springs, all combined as set forth.

259. Seeding Machines; T. J. Bottoms, Thomasville, Georgia.

Claim—The eccentric pin, lever, spring, valve, spreader, rag-pin, slide, and hopper, the whole arranged as described.

260. Portable Fence; R. J. Prown, Perry, Pennsylvania.

Claim—Constructing a portable fence without posts, by locking the panels together by means of dovetail tenons and gains, in the manner specified. Also, in combination with the above, the use of right and left-hand screws.

261. Seed Drills; O. H. S. Brumfield, Centreville, Indiana.

Claim—The teeth attached to the rod and placed between the drill teeth, when said rod is operated by the pitman and cranks, so that the teeth will have the reciprocating and rising and falling movement communicated to them.

262. Cotton Presses; T. J. Bottoms and J. A. Bullock. Thomas Co., Georgia.

Claim—The combination of the follower staff, bridle, lever, follower, and the revolving perforated box, operating as described.

263. Rotary Pump; Levi Burnell, Milwaukie, Wisconsin.

Claim—Operating the double sets of radially sliding pistons in direction at right angles to each other, by means of the three-sided stationary cam, the rotating cam box, and the cam yokes, arranged in the manner set forth.

264. Manufacturing Shears; Wm. S. Butler, Rocky Hill, Connecticut.

Claim—A pair of shears made of cast iron, with their cutting edges hardened or tempered, in the manner described.

265. Recumbent Chair; David Buzzell, Charlestown, Massachusetts.

Claim—The arrangement and application of a lever and notched cams to either or both sides of the seat frame, and to the back and leg rest, substantially as explained.

266. Printers' Composing Sticks; Alexander Calhoun, Hartford, Connecticut.

Claim—The application of the band, in the manner described.

267. Sewing Machines; D. W. Clark, Bridgeport, Connecticut.

Claim—Imparting the necessary intermittent motion to the feed wheel, by means of an endless belt and vibrating pincers, arranged as described.

268. Seeding Machines; Smith Conklin and George Newton, Sterling, Illinois.

Claim—The arrangement and combination of the plate, guide, bars, and box, as described.

269. Sun Shades; A. G. Davis, Watertown, Connecticut.

Claim—The rod provided with the hub or boss, and the pressure bar and stop, in connexion with the hollow or tubular rod provided with the ferrule, the above parts being arranged in relation with the frame and slide, as set forth.

270. Carpet Fastener; Morris Dewey and Ira Phillips, Clarendon, New York.

Claim—The pin and the set, as described, combined and arranged for fastening carpets to floors, in the manner specified.

271. Railroad Car Seats; John C. DeWitt, West Broomfield, New Jersey.

Claim—Sustaining the bottoms of the car seats on the slotted corners of the oscillating cradles, capable of being turned on horizontal transverse shafts, and combining and arranging therewith slotted bars, connected at their upper ends to the backs of the seats by bars and oscillating levers, and movable trucks with tilting platforms, in such a manner as to enable the seats to be sustained and secured in the proper position to accommodate the passengers in a sitting posture, or their bottoms and backs, to be brought to the proper angle of inclination with the tilting platforms, and in relation to each other to form sleeping and reclining couches or berths.

272. Upsetting Carriage Tire; E. J. Dodge, Port Washington, Wisconsin.

Claim—Arranging the anvil blocks or supports to rock on a centre, in the manner specified. in combination with the arranging of the jaws of the intermediate guide or support, to be adjusted separately or both together up and down.

273. Sash Fastener; R. J. Falconer, Washington City, D. C.

Claim—Extending the cap portion of the catch over and along the front edge of plate to form a catch opening flush with the edge of plate, so that the window cannot be unfastened without having the point of the hook withdrawn entirely clear from the meeting rail of the upper sash, and out of the way of the bars when the lower sash is raised.

274. Method of Sending and Receiving Messages Simultaneously over the same Telegraphic Wire; M. G. Farmer, Salem, Massachusetts.

Claim—The employment of an accessory magnet and an accessory battery to each instrument, in com-

bination with the main batteries and main magnets, and with a means of reversing the direction of the current of each of the main batteries.

275. Hanging Mill-stones; Joseph A. Forsman. Cincinnati, Ohio.

Claim—The combination and arrangement of devices for hanging and adjusting the bedstone and runner to the frame and to each other.

276. Car Seats and Couches; K. Freeman, Fond du Lac, Wisconsin.

Claim—Making one of the ends of car seats detachable, and the seats on one side of the car so that they can be brought in direct contact with those immediately opposite, so as to transfer the longitudinal passage way from the centre to one side of the car, and in combination with the said car seats a series of bars and rods, capable of being folded together, and contained within the lower parts of the seats, or raised and elongated so as to form supports for horizontal single sleeping berths or couches, placed one above the other at suitable distances apart.

277. Steam Cock; Albert Fuller, Cincinnati, Ohio.

Claim—Placing the elastic plug on the valve stem between the metallic shield and cap, the parts being arranged relatively with the valve seat.

278. Top Rollers for Spinning Machines; Charles Greene, Salem, Massachusetts.

Claim—The application of a top roller of a spinning machine to its spindle, so as to be capable of rocking and rotating them.

279. Method of Stretching Boots and Shoes; George W. Griswold, Carbondale, Pennsylvania.

Claim— Stretching boots or shoes from the outside, and at any part or point, without stretching other parts or points, by means of a skeleton last on the inside and a pressing apparatus on the outside of said shoe or boot.

280. Portable House Bell; Albert W. Hale, New Britain, Connecticut.

Claim—A spring hammer tongue provided with a projection, so arranged as to be operated upon by a pin attached to an arbor.

281. Drawing Boards; Issacher P. Hansell, Springfield, Illinois.

Claim—The strips placed at each side of the board, and having their outer edges curved or made of concave form, and used in connexion with the square having its blade and head arranged relatively with respect to each other, as set forth.

282. Mills for Sugar Cane; Jeremiah Howard, City of New York.

Claim—The employment or use of a pump, water reservoir, and valve, in connexion with necessary pipes and cylinders, provided with pistons acting on the bearing of the roller or rollers.

283. Lock-joint Fastener for Studs, &c.; Ira A. Ives, City of New York.

Claim—The spring hinged pin, in combination with the recess, substantially as described.

284. Hydrant; James R. Higgs, Utica, New York.

Claim—1st, The cylinder, c, constructed substantially as described. 2d, The combination of the cylinder with the upper valve and its rod, when contained and operated in case, as described. 3d, The combination of the cylinder and valve with the waste rod and waste pipe, as described. 4th, The combination of the cylinder and valve with the lower valve, as described.

285. Apparatus for Prison Alarm; Wm. O. Hills, Nottingham, New Hampshire.

Claim—The tubular or chambered window or door grating, an alarm apparatus and an air pump or apparatus, as described, or the equivalent therefor, combined so as to operate together, as specified.

286. Sad Iron Heater Cover; Wm. Heath, Bath, Maine.

Claim—The cover for sad iron heater, constructed as described.

287. Lifting Jacks; Joel C. Jackson, Rochester, New York.

Claim—The arrangement of the screw, slides, and nut, in combination with the bar or fork, in the manner described.

288. Harvesting Machines; Henry G. Kaufman, St. Louis, Missouri.

Claim—1st. The arrangement and combination of the wheel, with the devices before described, viz; the levers, turn-table, and the ratchet and standard, for the purpose of operating the said wheel so as to guide the machine and raise the knives from the ground. 2d, The combination of the finger plate with the knife plate and the knives, when these several parts are constructed in the manner specified.

289. Lamps; James P. and Ellen Kenyon, Brooklyn, New York.

Claim—1st, Constructing and arranging the wick tubes so that the orifice of the air passage at the upper ends of said tubes may be expanded or contracted without the necessity of changing the relative position or location of the lower ends of said tubes to each other. 2d, The band provided with the ears, applied to the wick tubes, and used with or without the central strip.

290. Method of Attaching the Spreader to Saws of Circular Sawing Machines; Wm. D. Leavitt, Cincinnati, Ohio.

Claim—Furnishing the side of the saw plate with the groove or recess, when the spreading flanch is arranged therewith in the manner represented, for the purpose of preventing the end of the lumber when being sawed from butting against or catching to the end of the said flanch.

291. Locks; John P. Lord, Manchester, New Hampshire.

Claim—1st, The application of the guides, or their equivalents, also the groove and spring, or their equivalent. 2d, The application of the tongue and guards, or their equivalent, combined with the bolt. 3d, The application of the slotted stud. 4th, The application of the slotted rotary wards, or their equivalent, in combination with the driving pins and indicator, or their equivalent. 5th, The application of the driving ward gear and driving bolt gear, or their equivalent. 6th, The application of the key, L, in combination with the ward and bolt gears.

292. Hinges for Window Blinds; John Loudon and Hans Iverson, City of New York.

Claim—The combination of the lever on one part of the hinge with the plate on the other part, for the purposes specified. Also, the plates connected with the respective parts of the hinge by the countersinks, and holding said hinge in the desired position by the cam lever and notches in the plate.

293. METHOD OF SEALING PRESERVE CANS; W. W. Lyman, West Meriden, Connecticut.

Claim—Exhausting and sealing fruit jars and cans, or other similar vessels, by means of the tube, the cement, and opening, and an exhausting apparatus, by which means the operation is rendered very easy, simple, and effective, and the closing of the air vent accomplished by the same device, through or by which the air is drawn from the can.

294. SEEDING MACHINES; J. B. McCormick, Versailles, Kentucky, and Wm. R. Baker, Boston, Mass.

Claim—The arrangement and combination of the rotating wheel with the stationary plates or shares.

295. SEEDING MACHINES; E. L. Lyon, East Randolph, New York.

Claim—The sliding seed boxes attached to the radial bars and outer end pieces of the seed boxes, being provided respectively with the recesses and the outer ends of bars projecting beyond the peripheries of the wheels. Also, in combination with the above-named parts, the covering shares.

296. MACHINE FOR BENDING FELLOES; John L. Mann, Ravenna, Ohio.

Claim—The arrangement of the mounted forming block and the system of tracks, when used in combination with the apparatus described.

297. RAILROAD CAR SEATS; C. M. Mann, Detroit, Michigan.

Claim—The two car seats, constructed so that they may be turned from the ordinary form of seats, one to the right, the other to the left, one-fourth round, bringing the ends next the windows to meet together, and the backs or hinges may be turned over and fall upon the ledge upon which the ends before rested, and are held firmly in place as a bed by the pin. Also, the bed formed in combination with the door and pillow, which, being on hinges, opens into place upon the bed for use, or may be instantly shut out of the way and out of of sight at pleasure. Also, the columns, B, each containing and concealing two counter weights, in combination with the upper and lower movable beds. Also, the general device, combining the upper and lower beds and seats with the legs and columns, and counter weights, all convertible either into beds or seats for four, at pleasure, so that all, or a part of them, may sit up or lie down in the space occupied by four persons.

298. CHILDREN'S CARRIAGE; Wm. P. McKinstry, City of New York.

Claim—The use of three draft bars or handles attached to a child's carriage, and operated as described.

299. WELDING BELLOWS PIPE; A. Pearsall, Nashville, Tennessee.

Claim—The inclined mandrel, clamps, and roller, combined for joint operation.

300. SEEDING MACHINES; Lewis Moore, Ypsilanti, Michigan.

Claim—The combination of the zigzag strip, projecting from the bottom of a reciprocating bar, with an adjustable gauge plate, which has different sized cells, and with a hopper having oblong slots or discharge passages in its bottom.

301. HEMMING GUIDES FOR SEWING MACHINES; Henry B. Odiorne, Philadelphia, Pennsylvania.

Claim—Constructing the pressure pad of a sewing machine with recesses, arranged as described, in combination with the curved tongue, or its equivalent.

302. CAR SEATS; Wm. Painter, Wilmington, Delaware.

Claim—1st, Jointing the ends of the backs of the seats to the swinging bars at points between the centres and corners of the same, and combining and arranging the pins or studs on the ends of the backs, and the pins or studs on the faces of the arm rests, or on the ends of the backs, in such relation to the bars and slots as to enable them to be suspended in the proper relation to the bottoms of the seats, to form the usual seats, or to be swung and extended, to form reclining or sleeping couches. 2d, The combination of the spring bars or catches, having studs at their ends and segmental slots, with the swinging seat bottoms.

303. COTTON GINS; Henry C. Parkhurst, City of New York.

Claim—Constructing the hoppers of cylinder cotton gins with the fixed end pieces and movable end pieces, on the breast board, attached by the joint.

304. HORSE RAKES; L. H. Parson and George Houston, Middletown, New York.

Claim—The arrangement and combination of the rake, toothed sector, toothed ring, supplemental springs, and clearers.

305. MACHINES FOR TIGHTENING AND SECURING METALLIC BANDS FOR COTTON BALES, &c.; George W. Penniston, North Vernon, Indiana.

Claim—The construction of my hoop tightener and holder, in connexion with doors, and arms, and lever, constructed as described.

306. OILING THE THREAD FOR SEWING MACHINES; Truman W. Pepper, City of New York.

Claim—The described improvement in oil vessels for sewing machines, namely, providing the vessel with the regulating plug, neck or spout, and porous material, over which the thread is drawn.

307. MACHINE FOR MAKING CHAIN; E. P. Perry, Providence, Rhode Island.

Claim—The combination of a separating die with the tube, wherein the chain is formed, for the purpose of permitting each link of the chain after it has been struck into form to be transmitted to the tube.

308. CORN HUSKERS; C. J. C. Peterson, Davenport, Iowa.

Claim—1st, The feeder. 2d, The butter. 3d, The husker. 4th, The farmer. 5th, The receiver, in combination with the farmer, husker, butter, and feeder, when these several parts are arranged to operate conjointly as described.

309. CARDING MACHINES; Charles E Price and James Haythorn, Thompsonville, Connecticut.

Claim—The spirally grooved or threaded cylinder, E, applied in the manner described, in combination with the doffer and comb, and with a tube.

310. CARPET FASTENER; Joseph Reynolds, New Britain, Connecticut.

Claim—The hook and plate in one piece, as described.

311. VALVE COCKS; J. R. and H. S. Robinson, Clinton, Massachusetts.

Claim—1st, The construction of the valve, whether in one or two pieces, valve spindle, and valve case, in the manner described, so as to make a straight passage through the valve, spindle, and case. 2d, Making the valve in two pieces, for the reasons specified. 3d, When the valve is so made, running the springs through the spindle, for the reasons specified.

312. Straw Carriers of Threshing Machines; F. W. Robinson, Richmond, Indiana.

Claim—The combination of the perforated platform with the endless chain of slats.

313. Shutter Operators; Isaac Rogers, Oswego, New York.

Claim—The lever, rod, crank, and slide, the whole being arranged on the shutter and window frame, as set forth

314. Shears; James H. Roome, City of New York.

Claim—The combination of the additional connecting rod, F, with the rod, D, and upper slotted handle, for enabling the leverage exerted by the thumb to be increased with the closing of the upper blade.

315. Window Fastener; Irving Root, Austin, Texas.

Claim—The plate and thimbles, the groove, the spring plate, and cylinder.

316. Apparatus for Paying Out Telegraph Cable; George Scott, Wiscasset, Maine.

Claim—In combination with a delivering roller or a system of delivering rollers, a tilting lever, or its equivalent, and a brake mechanism, or any equivalent therefor, for arresting or controlling the revolution of the delivering roller or rollers, the whole being made to operate in such manner as to increase the paying out or delivery of the cable under increase of tension of it, as described. Also, when the lever is applied to a brake apparatus and a guide roller, essentially as described, combining the guide roller with it by means of a spring. or making the outer arm or the lever as a spring, for the purpose of enabling such spring to operate the lever, in manner and under circumstances as set forth. Also, combining the inertia weight with the spring lever, so as to cause such to operate, as specified, under a sudden upheaval of the stern of the vessel.

317. Fare Boxes for Omnibuses, &c.; I. B. Slawson, New Orleans, Louisiana.

Claim—1st, The arrangement of an opening in the top of the fare-box, through which outside passengers can deposit their fare, when such opening communicates with a chamber in which the fare first falls, and is temporarily arrested previous to being deposited in the receiving drawer beneath. 2d, The arrangement of the passage block and cover, over the opening in the top of the fare-box.

318. Clasps for Hoop Skirts; A. Smart, City of New York.

Claim—A hoop clasp constructed with a longitudinal loop, substantially as described.

319. Churn; John E. Smith, Galen, and Wrightman Brown, Rose, New York.

Claim—The combination and arrangement of the cylinder divided into two chambers by the partition, the close interior case, adjustable vane blower and regulator, refrigerating passage, and ventilators.

320. Seeding Machines; Joseph D. Smith, Lancaster. Ohio.

Claim—The arrangement and combination of the spout, wheels, frame, H, and frame, D, as described.

321. Feet Warming Device; George W. Smith, Aurora, Indiana.

Claim—The employment or use of the chamber when applied to a forge, and heated by steam generated within a box, or its equivalent, by the force of the forge.

322. Cultivators; Nathaniel S. Smith, Buffalo, New York.

Claim—The use of the double joint piece to connect the gang of hoes to the axle, when said joint piece extends beyond the axle, and subserves also the purpose of a foot lever to throw the hoes out of the ground.

323. Propeller for Boats; Le Grand C. St. John, Buffalo, New York.

Claim—1st, The construction and use of a propeller case having three conduits arranged on parallel lines, so that the water will be received into the case through the outside conduits at the same stroke of the piston that water is discharged through the middle conduit, and vice versa. 2d, The arrangement of two revolving pistons with respect to an enclosing case, whether said case is made single or double, and the combination thereof with a boat, so that in the act of propelling, water will be received into the case at an orifice or channel, and discharged at another orifice or channel through the bottom of the boat. 3d, The construction of my revolving pistons, partly of wood and partly of iron.

324. Machine for Cutting Irregular Forms; Henry D. Stover, Boston, Massachusetts.

Claim—1st, The guards and bar, carrying them combined with the revolving cutters and table, in the manner described. 2d, The guide, so constructed and fitted to the outer surface of the bearing or tube, as to be vertically adjustable thereon to guide the pattern without wearing it, while the piece secured to the pattern relieves the shape from the cutting knives immediately above. 3d, The combination of the adjustable elastic sleeve with the tube or bearing and guide, in the manner described. 4th, The slabbed spindle, collars, and the cutters, constructed and relatively arranged and operated in connexion with each other, essentially in the manner described.

325. Rolling Railway Chairs; James H. Swett, Pittsburgh, Pennsylvania.

Claim—The process of rolling railroad chairs, the cutting under or into the solid iron for the purpose of forming the jaw, after the bar is rolled and bent, and thus avoid the raising up and afterwards bending down of the part that is to form the jaw, as heretofore done.

326. Bracelets; Francis M. Sweet, Syracuse, New York.

Claim—The employment of the elastic rubber or spring connexion between the two parts of the bracelet, operating substantially as described, and when the parts F and C are furnished with guides, in the manner set forth.

327. Hat Body Machinery; Alva B. Taylor, Newark, New Jersey.

Claim—The combination of a disk picker operating with a perforated former. Also, a disk picker composed of two disks, whose faces are studded with teeth to pick fibrous material fed into the eye of the picker, and to discharge the picked fibre at the run thereof.

328. Grain Separators; John D. Tifft, Cuyahoga, Ohio.

Claim—The employment of a circular side valve, in combination with the directing board, when the parts are constructed and arranged as set forth.

329. Traveling Casket; T. R. Timbey, Medina, New York.

Claim—Attaching the stiff sides of the traveling casket to the intermediate metal or other framing, by means of rubber or other springs.

330. Ox Yokes; George W. Weeks, Boston, Massachusetts.

Claim—Making ox bows and yokes ot iron, or other suitable material, hollow.

331. Washing Machine; Thomas J. Tindall, City of New York.

Claim—Combining with a suitable vessel for containing the clothes, &c., to be washed, and the washing liquid, and the exhausting pump, or equivalent therefor, communicating with the said vessel above the intended charge, to exhaust the said vessel above the charge and relieve the pressure, to effect the circulation of the washing liquid by ebullition below the recognised boiling point.

332. Rolling and Piling Logs; Wm. Todd, Cherryfield, Maine.

Claim—The combination and arrangement of the tapered roller with the diagonally arranged cylindrical rollers, for facilitating and guiding the movements of logs and heavy timbers, and piling the same in ranks or on teams and vessels.

333. Apparatus for Roasting Coffee; Samuel Tower, Grand Rapids, Michigan.

Claim—Having a portion of each of the journals or axles attached to each sphere or shell, and otherwise arranged or combined, so that when the spheres or shells are closed, the axles or journals will be completed and the shells will be locked.

334. Bridge; L. E. Truesdell, Warren, Massachusetts.

Claim—1st, An iron bridge constructed with a series of horizontal chords, in combination with vertical standards and diagonal braces, or their equivalents. 2d, Constructing the clamp in the manner set forth.

335. Seeding Machines; Alexander Turner, Redden Bess, and Hervey Sloan, Franklin, Indiana.

Claim—The arrangement of the seed boxes, the seed slide, rod, wheels, and ploughs, in the manner specified.

336. Safety Valve and Pressure Gauge; James H. Winn, Portage, Wisconsin.

Claim—The weighted pendulous rods and suspended index, L, applied in relation with each other and with the dial, and combined with the piston valve by means of a sector, chain, and rod, or their equivalents.

337. Attaching the Prop of Carriage Bows; D. B. Wright and L. Sawyer, South Amesburg, Massachusetts.

Claim—A carriage prop in which the prop, C, is rendered independent of its plate.

338. Corn Planters; Franklin W. White, Worcester, Massachusetts.

Claim—Operating the seed slides through the rod and its arm, and the hole or holes in the wheel. Also, in combination with a dropping apparatus and the double mould-boards for opening the furrow, the openings and guides, for admitting and directing the earth or soil that is to cover the seed.

339. Trace Fastening; John C. De Witt, West Bloomfield, Assignor to self and Terah Benedict, Newark, New Jersey.

Claim—The frame or body provided with the tongue projecting from it at right angles, when the frame or body is connected with the plates of the tug, by means of the pivots of said plate fitting in oblong slots in the sides of the frame or body, so that the same may be shoved forward and backward to admit of its being locked, and also of being opened.

340. Inkstands; V. Fogerty, Cambridgeport, Assignor to Francis Houghton, Somerville, Massachusetts.

Claim—In combination with an inkstand or ink-reservoir and its mouth, a dipper or vessel so applied within said reservoir as to be capable of being within it, and towards and away from said mouth, for the purpose of taking up ink or a liquid from the reservoir. Also, the application of the dipper to the movable cap of the mouth of the reservoir, so as to be operated by the said cap.

341. Knitting Machines; Thomas Lovelidge, Assignor to self and Wm. Tulfirth, Germantown, Penna.

Claim—The pressure plate situated between the two rows of thread guides, and operated so as to press the loops down the needles.

342. Seed Planters; W. A. Mahaffy, Carimona, Minnesota, Assignor to John Greek, Evansville, Ind.

Claim—The seed slides, in combination with the wheels or cylinders, arranged for joint action, as set forth.

343. Regulating the Tension of the Thread in Sewing Machines; John T. B. Rogers, City of New York, Assignor to George B. Sloat. Philadelphia, Pennsylvania.

Claim—The combination of the cone and conical cap, for the purposes set forth.

344. Cut-off for Steam Engines; Jacob Windmer, Assignor to self and Howard Gilbert, New Haven, Conn.

Claim—The combination of the bevel gear pinion, operated by the endless chain and rod, with the bevel gear wheel with its cam.

Re-Issues.

1. Continuous Sheet Metal Lathing Surface; John B. Cornell, City of New York; patented May 13, 1856; re-issued August 3, 1858.

Claim—A closely united plaster, supporting metallic surface of substantially the shape described, when used in the construction of partitions, &c., which are designed to be fire-proof and burglar-proof.

2. Omnibus Fare-box; I. S. Reeves, Assignor to J. B. Slawson, New Orleans, Louisiana; patented February 23, 1858; re-issued August 3, 1858.

Claim—1st, The glass plates, as arranged in connexion with the apron, in the manner set forth. 2d, Closing the passage to the drawer below from the chamber above by means of an apron operated by a spring, in the manner as set forth.

3. Reaping Machines; C. H. McCormick, Chicago, Illinois; patented January 31, 1845; re-issued August 3, 1858.

Claim—The employment of the projecting ends of the reel ribs to effect the separation of the grain to be cut from that to be left standing, in combination with a dividing apparatus which effects a division of the grain to be cut from that to be left standing, by forming an open space between the outer and inner grain for the ends of the ribs of the reel to act in, in which open space there is no reel post or other obstruction to prevent the free passage of the grain as it is brought back by the ends of the reel ribs to the platform of the machine, and by which means a separation of the inside grain to be cut from the outside grain to be left standing is made complete by the action and power of the reel.

4. Reaping Machines; C. H. McCormick, Chicago, Illinois; patented January 31, 1845; re-issued August 3, 1858.

Claim—The downward curve or bend of the beams that support the cutting apparatus to facilitate the discharge of any clogging matter that may enter.

5. Knife Polishers; W. H. Horstman, City of New York, Assignee of Reuben Shaler, Madison, Connecticut; patented Nov. 28, 1848; re-issued August 10, 1858.

Claim—The combination of the hopper, polishing surface, and spring, or their equivalents.

6. Printing Press; George P. Gordon, City of New York; patented January 1, 1858; re-issued August 10, 1858.

Claim—1st, The arrangement and combination of a rotating disk, w, with an annular ring or outside disk, x, the two revolving each in an opposite direction to the other, for the purpose of breaking up the ink, so that it shall by such contrary motions become evenly distributed, and thus imparted to the rollers which ink the form of types. 2d, Moving the rollers, "one or more being used," for inking the form from the parallel position they necessarily assume, for this purpose changing to an oblique position, which shall give to them a lateral motion, when in contact with the distributing disks, or some equivalent. 3d, The arrangement of a form bed, which alternately varies its motion during its reciprocating movement, viz: first traveling under and in contact with a cylinder to give an impression, then being withdrawn from contact with the cylinder, and remaining withdrawn during the re-movement to prevent an impression, such bed reciprocating and at the same time alternating from one of these positions to the other; thus performing two separate and distinct motions, entirely independent of, and in contrary direction to, each other, while remaining in gear with the cylinder, when such bed shall be used with a cylinder, or its equivalent, having a part revolution with a reciprocating movement. 4th, Attaching to the reciprocating form or type bed, an adjustable rack as well as a stationary rack, which two racks shall play into gear, upon a cylinder or segment of a cylinder, so that any and all wear or variation may at once be taken up by adjusting the movable rack, and by this means always cause the bed and cylinder or segment of a cylinder to work in harmony with each other, and produce a clear and sharp impression free from slur. 5th, I do not claim placing a reciprocating bed in a vertical position, or any given angle from a horizontal position—but I claim so placing the bed when used with a rotating reciprocating cylinder or segment of a cylinder, which shall place or pile the sheets of printed paper upon the fly-board.

7. Turning and Sliding Tables for Railroads; Wm. Sellers, Philadelphia, Pennsylvania; patented March 23, 1858; re-issued August 10, 1858.

Claim—Interposing the central part or box between the ends of the truss rail beams, in such manner as to make use of the width of said central part or box as a portion of the length of said beams—when the said beams and central box are so constructed and connected as to form a table entirely supported from the central part or box.

8. Coffee Pots; Charles B. Waite and Joseph W. Sener, Fredericksburg, Virginia; patented April 22, 1856; re-issued August 10, 1858.

Claim—The arrangement whereby the steam from the boiler is discharged into the water in the condenser, which absorbs the aroma, in combination with the syphon for returning the contents of the condenser into the boiler.

9. Surface Condensers for Steam Engines; J. P. Pirsson, City of New York; patented April 2, 1850; re-issued August 10, 1858.

Claim—1st, So enclosing the condensing surfaces of a surface condenser, within a tank which is constructed to be capable of acting as a jet condenser, that when the said surface condenser shall become deranged by breaks or otherwise, resort may be had to the jet condenser, whereby condensation may be continued and the vacuum maintained. 2d, The combination of a surface condenser with a box or case, in such manner that the condensation of the steam shall be effected therein without subjecting the said surface condenser to atmospheric pressure. 3d, The aperture, w, or its equivalent, for maintaining the vacuum, and as a passage for any steam which may remain uncondensed in the radiating condenser. 4th, Connecting the evaporator with the chamber, h, substantially in the manner described, whereby the saturated water can be drawn off from the bottom of the evaporator.

10. Skirt Hoops; David Holmes, Westfield, Massachusetts; patented June 15, 1858; re-issued Aug. 17, 1858.

Claim—1st, Connecting the hoops to each other by a series of loops. 2d, Attaching to the hoops the tapes or other articles by which the hoops are suspended, by means of metallic clasps which embrace the hoops. 3d, Forming eyes in the braiding at the extremity of the hoops to serve as a slide.

11. Watch Cases; W. E. Baldwin and E. Bliss, Newark, New Jersey, Assignees of John F. Watson, St. John's Square, Clerkenwell, England; patented April 13, 1858; re-issued August 17, 1858; patented in England, June 16, 1857.

Claim—Reversing the inner case containing the works and dial in the outer case to present the dial on either side. Also, pivoting the inner case containing the works and the dial to the ring of the outer case, or by equivalent means, so that it can be reversed to present the dial in either direction without disconnecting it from the outer case.

12. Watch Cases; W. E. Baldwin and E. Bliss, Newark, New Jersey, Assignees of John F. Watson, St. John's Square, Clerkenwell, England; patented in England, June 16, 1857; patented April 13, 1858; re-issued August 17, 1858.

Claim—1st, Attaching a pendant in double case watches permanently to the ring of the outer case. 2d, Connecting the inner case with the ring of the outer case, so that the inner case containing the works on dial can be reversed and held within the ring of the outer case to exhibit either the back or the dial through the bizzle, and so that the inner case may be held in the ring of the outer case independently of the closing of the outer case. 3d, In reversing the inner case containing the works and dial in the outer case to present the dial on either side, I claim shifting the dial one quarter of a circle, or by equivalent means, so that the figures of the dial may be properly located relatively to the pendant for either the ordinary open face watch, or the ordinary hunting watch. 4th, Forming the ring of the inner case with a flanch or rib, in combination with a corresponding flanch, rib, or rest on the ring of the outer case, to give the required support to the inner case within the outer case when reversed, to present the dial in either direction.

13. Manufacture of Hard Rubber Goods; Gustavus Cuppers, College Point, New York; patented July 20, 1858; re-issued August 24, 1858

Claim—The improvements in the hardening and vulcanizing of india rubber or gutta-percha, by which the manufacture of perfectly shaped articles may be facilitated.

14. Pumps; Hosea Lindsey, Ashville, North Carolina; patented Dec. 4, 1855; re-issued Aug. 24, 1858.

Claim—1st, The combination and arrangement of the vertical central conducting pipe, horizontal double chambered or double valved-receiving and supplying cylinder, two alternately reciprocating pistons or plungers, and piston connecting and guide rods. 2d, Effecting the reciprocation of the piston or pistons, by means of a curved inclined plane, arranged horizontally on the bottom of the well.

15. Harvesters; N. Platt, formerly of Ottawa, Illinois, Assignor to W. H. Seymour and D. S. Morgan, Brockport, New York; patented June 12, 1849; re-issued May 23, 1854; re-re-issued Aug. 31, 1858.

Claim—1st, Combining with a machine for cutting grain and gathering it upon a platform, a raking mechanism which at suitable intervals sweeps the grain off the platform, changes the direction of its stalks relative to the path of the machine, and discharges it upon the ground in gavels. 2d, The employment of a sweep or vibrating rake, operating in such manner that while sweeping the grain off the platform and discharging it upon the ground it will change the direction of the stalks. 3d, The method of vibrating a sweep rake, and turning its teeth in such manner that they will pass over the grain points foremost at intervals to reach back and seize the grain and sweep it off the platform. 4th, The method of holding a sweep rake firmly, while raking the grain with the points of its teeth, in the proper position relative to the platform, by means of a latch, or other equivalent thereto, which operating with a greater certainty than a weight, spring, or other fastening not rigid, more effectually prevents the rake teeth from rising to override the grain, and at the same time avoids the necessity of moving a heavy weight, or of overcoming the tension of a strong spring, in elevating the rake preparatory to its retrograde stroke. 5th, The construction and arrangement of a sweep rake and the mechanism for operating it, in such manner that it is carried back and forth, and its teeth raised and lowered without support at the outer end. 6th, Changing the frequency of the alternations of the raking mechanism, by means of the shifting gear, or other equivalent devices, for producing a varying rate of motion for the purpose of varying the size of the sheaves as may be required.

16. Harvesters; N. Platt, formerly of Ottawa, Illinois, Assignor to W H. Seymour and D. S. Morgan, Brockport, New York; patented June 12, 1849: re-issued May 23, 1854; re-re-issued Aug. 31, 1858.

Claim—The combination of the vibrating sweep rake with the lever carrying the same, vibrated by gearing located within the inner edge or circle of said platform, as set forth.

17. Harvesters; N. Platt, formerly of Ottawa, Illinois, Assignor to W. H. Seymour and D. S. Morgan, Brockport, New York; patented June 12, 1849; re-issued May 23, 1854; re-re-issued Aug. 31, 1858.

Claim—Constructing that portion of the platform of the reaping machine which is traversed by a rake working above it, with a solid floor so shaped as to allow the points of the teeth of the rake to move below the plane traversed by the grain, substantially as set forth.

18. Harvesters; N. Platt, formerly of Ottawa, Illinois, Assignor to W. H. Seymour and D. S. Morgan, Brockport, New York; patented June 12, 1849; re-issued May 23, 1854; re-re-issued Aug. 31, 1858.

Claim—The combination of a vibrating sweep rake with a fence or guard, to prevent the grain from being deflected from the path of the rake by centrifugal force, substantially as set forth.

19. Steam Boilers; F. P. Dimpfel, Philadelphia, Pennsylvania; patented April 1, 1856; re-issued August 31, 1858.

Claim—The arrangement of the tubes, and the connexion of one or more receptacles for consuming the fine particles of coal which are carried by the force of the blast or draft from the fire chamber into the flues, the said receptacle being placed below the bottom of the main flue, and communicating therewith, and between the fire chamber and a check or deflector, or between checks and deflectors in the main flue, to check the momentum of the particles of coal, and cause them to drop into the receptacle to be consumed. Also, in the construction of the boiler forming a single flue in the middle, for the passage of the products of combustion from the main flues surrounding the water tubes to the smoke box, when this is connected with a check or deflector placed in the main tube, among the water tubes and in front of the said middle flue, to prevent the products of combustion from taking a direct course to the said middle flue. Also, arranging the bent up ends of the water tubes where they are connected with the crown sheet of the furnace, in a series of double longitudinal rows, and leaving spaces between the double rows of greater width than the external diameter of the water tubes, to admit of taking out and inserting the tubes, whilst in other respects the said tubes may be placed as near to each other as may be desired. Also, interposing the net-work or plate between the rear end of the flue and the smoke-stack, and the exhaust pipe. Also, combining with the deflector in the smoke box the receptacle for the sparks or fine particles of coal dust, for preventing the sparks from being consumed or accumulating in the smoke box, and interfering with the draft.

20. Manufacture of Textile Hose; L. B. Cooley and James C. Cooke, Assignors to Linus B. Cooley, S. Babcock, and B. G. Cooley, Middletown, Connecticut; patented March 16, 1858; re-issued Aug. 31, 1858.

Claim—The double tube or hose, woven in the manner specified, and this we claim whether used for hose belting, card clothing, shoe soles, harness pads, and traces, or any other purpose.

Designs.

1. Can Covers; John F. Bodine, Assignor to self, Wm. H. and J. Alfred Bodine, Williamstown, New Jersey; dated August 3, 1858.
2. Cooking Stoves; R. Ham, Assignor to Smith, Sheldon & Co., Troy, New York; dated August 3, 1858.
3. Towel Stands; Nathaniel Waterman, Boston, Massachusetts; dated August 3, 1858.
4. Printers' Types; George Bruce, City of New York; dated August 10, 1858.
5. Door Lock Plates; Cornelius B. Erwin, New Britain, Connecticut; dated August 10, 1858; two cases.
6. Door Lock Plates; Henry E. Russell, New Britain, Connecticut; dated August 10, 1858.
7. Box Stoves; N. S. Vedder and Henry Ripley, Assignor to N. S. Vedder, aforesaid, Troy, New York; dated August 10, 1858.
8. Cooking Stoves; N. S. Vedder, Troy, New York; dated August 10, 1858.
9. Parlor Stoves; N. S. Vedder, Troy, New York; dated August 10, 1858; two cases.
10. Stoves; Jacob Steffe, James Horton, and John Currie, Assignors to David Stewart and Richard Peterson, Philadelphia, Pennsylvania; dated August 17, 1858; two cases.
11. Roll Pans; Nathaniel Waterman, Boston, Massachusetts; dated August 17, 1858.
12. Cooking Stove; Wm. P. Abendroth, Rochester, New York; dated August 31, 1858.
13. Screens; James L. Jackson, City of New York; dated August 31, 1858.
14. Bread Pans; Nathaniel Waterman, Boston, Massachusetts; dated August 31, 1858.

ABSTRACTS OF SPECIFICATIONS OF RECENT PATENTS.

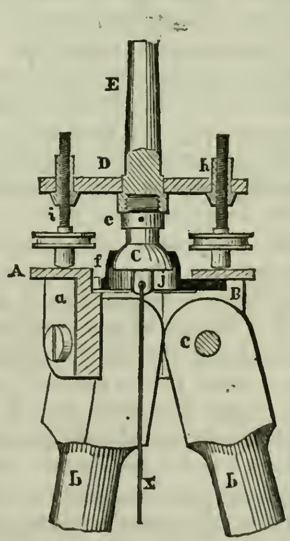
FROM H. HOWSON'S PATENT AGENCY, PHILADELPHIA.

For the Journal of the Franklin Institute.

Improvements in Surveyors' Tripods. Patent granted to W. J. YOUNG, Philadelphia, July 13th, 1858.

This invention relates to improvements in the heads of tripods used by surveyors in connexion with theodolites and other instruments, and the invention consists in so constructing the said heads, that the upper portion of the same to which the instrument and plumb-rule are attached, shall be separate from, and adjustable longitudinally to, the lower portion, to which the legs are jointed; the usual leveling screws being used as a means of binding the above mentioned portions of the head together after adjustment.

The object of the invention is to dispense with the usual process of moving and depressing one or other of the legs in order to bring the plumb-line to the desired position.



The annexed cut represents a sectional view of Mr. Young's improved tripod head.

The lower portion of the head consists of an annular plate A, from which project six flanches *a*. These combined, form three recesses for the upper end of the legs *b*, which are hung to pins *c*, attached to the flanches *a*.

The upper portion of the head consists of the circular plate D, to the centre of which is secured the pin E, for receiving the theodolite or other instrument.

To the pin E, on the underside of the plate D, is secured the end of the stem *e*, which projects from and forms a part of the hemisphere C, the latter fitting into the concave socket *f*, on the plate B, this socket projecting through the central opening in the annular plate A of the lower portion of the head. The plate B consists of three plain projections, each of which bears against the underside of the annular plate A, in one of the recesses formed by two of the flanches *a*.

Four nuts *h*, are secured to the plate D, and into these nuts screw the ends of the leveling screws *i*, the lower ends of which bear on the surface of the plate A, the screws being furnished with the usual disks with milled edges so as to be easily turned by the finger and thumb of the operator.

The plumb-line is attached to a pin *j*, which projects from the underside of the hemisphere *c*. As far as regards the upper plate D with its pin E, the hemispherical coupling and leveling screws *i*, the arrangement is similar in construction and operation to that of tripod heads in common use. The socket *f*, however, has hitherto either formed a permanent portion of that part of the head attached directly to the legs or a portion of a plate rendered adjustable horizontally by means of screws independent of those used for leveling purposes. If arranged in the former plan, the operator must resort to the usual tedious process of moving in or out one or other of the legs *b*, or depressing the same before he can bring the plumb-line to coincide with a given point in the ground. Should the latter be of a stony nature, the difficulty and delay attending the adjustment would be increased. The method of adjusting the upper portion of the head by means of horizontal slides and screws, a plan sometimes resorted to, requires a manipulation almost as tedious as that above described.

In Mr. Young's improved tripod head, the opening in the plate A, is larger in diameter than the socket *f*, which projects through the opening, and each of the three projections which form the plate B is narrower than the recesses formed by the flanches *a*.

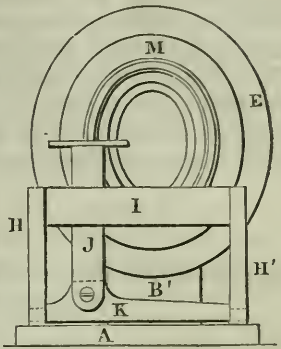
Consequently, when the leveling screws *i* are turned to an extent sufficient to relieve their lower ends from contact with the plate A, the plate D with its pin E, the instrument attached to the latter, the leveling screws I, the hemisphere C, its plumb-line, and the plate B, all of which appertain to the upper portion of the head, may be moved horizontally on the lower portion in any direction to a limited extent. After being adjusted to the desired position, the screws *i* may be turned until their lower ends bear on the surface of the plate A, and force the hemisphere C tight within its socket F, when the two portions of the head become firmly bound together.

It will now be seen, without further description, that the improved tripod head affords every facility for a rapid and exact adjustment of the instrument to the desired position by the hand of the surveyor, after the tripod has been placed in proximity to the point in the ground, with which the plumb-line must coincide. It will also be seen that the screws *i* serve the double purpose of leveling the instrument, and of securing the same in the position to which it may have been adjusted horizontally, thus enabling the operator to perform two duties without changing his position, and without the usual handling of different portions of the tripod.

Machine for Preparing Oval Picture Frames. Patent granted to WILLIAM GARDNER, New York, August 17th, 1858.

This invention relates to an improved mode of laying on to the wooden bodies of oval and circular picture frames, the coats of cement necessary to form the ground-work for the gilding; and the improvement consists in the combination of a lathe, the face plate of which is

caused to traverse in an oval path with a scraper formed to coincide with the desired moulding of the frame, the said scraper being self-adjusting laterally, so that it may accommodate itself to any irregular motion of the frame caused by the latter being placed between the intervals allowed for the drying of the several coats of cement in such a position on the face-plate of the lathe as not to coincide with the oval path of the latter.



On reference to the annexed cut, A represents the base of the machine, to which are secured uprights B for the spindle. E is the face plate connected with the spindle by such devices that it may revolve in an oval path. In front of the face plate, and at a suitable distance from the same, are erected the two uprights H and H′, which are connected together at the top by the transverse bar I. Between the latter is situated an arm J, which is jointed at the bottom to the rock-shaft K, the ends of which are allowed to turn freely in the opposite uprights H and H′. The top of the arm J is furnished with a thin metal plate, one edge of which is so cut out as to coincide with the form of the moulding of the frame M, the latter being attached to the face plate E.

The term "*preparing*" as applied to picture frames by those engaged in their manufacture, signifies the covering of the wooden body or foundation with the coatings of cement for forming the ground work for the gilding.

The preparation of oval picture frames has hitherto been accomplished by hand, the coats of cement being laid on at intervals of sufficient length to allow them to dry between each coat. When a sufficient body of cement has been laid on, it is polished with pumice stone until the desired smoothness is imparted to the surface, when it is ready to receive the gilding.

In Gardner's improved machine, the frame is temporarily attached to the face plate E, the cement applied to the moulding, and the scraper pressed towards it.

When one coat has been laid on, the frame is removed until partially dry, when it is again attached to the face plate to receive another coat and another application of the scraper, and this is continued until the required amount of cement is deposited on the frame, and the required smoothness attained.

In re-attaching the frame to the face plate after the several intervals allowed for drying, it is almost impossible to place it in the exact position it previously occupied; hence, the plan of securing the scraper to the vibrating arm J, which renders the scraper self-adjusting laterally to any irregularity in the movement of the frame.

By the above described machine, oval picture frames are prepared with that rapidity, uniformity, and accuracy which cannot possibly be attained by the ordinary process of preparing them by hand.

NOTE.—The right to this invention formed a subject of controversy between Mr. Gardner and Mr. J. A. Campbell, who also claimed to be the original and first inventor.

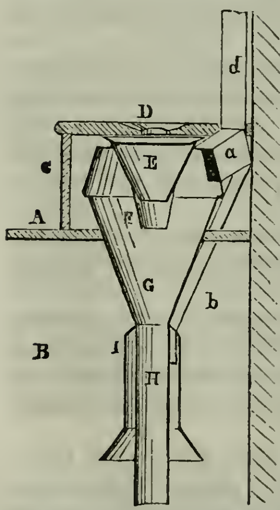
An interference was declared by the Patent Office, and testimony taken at Louisville, Kentucky, and in New York.

The Patent Office finally decided to grant patents to both parties; to Gardner a patent for the broad claim of a self-adjusting scraper with face plate revolving in an oval path; and to Campbell, a patent for a limited claim restricted to a specific arrangement of parts. H. H.

Improvement in Water-Closets. Patent granted to ISAAC EDELMAN, Philadelphia, September 1st, 1858.

This invention consists in surrounding the pipe which contains the basin with a casing attached to and communicating with a pipe or flue, and this flue with an exterior atmosphere, for the purpose of effectually ventilating the soil pipe and the well for receiving the soil, thereby obviating the offensive smells and noxious exhalations common to other water closets, and without the necessity of employing the usual valve beneath the basin.

The annexed cut represents a sectional view of the improved water-closet. A represents the floor of the apartment in which the closet is situated, and B the well which serves as a reservoir for the soil.



On the floor is erected a box C, in the cover of which is the usual opening D. Immediately beneath the latter is situated the basin E of porcelain or other material usually employed in their construction. This basin rests in the enlarged portion of the tapering pipe F, which is secured to the top of the casing C, and which projects into and communicates with the interior of that casing, to the small end of which is attached the soil pipe H, surrounded by a pipe I which is attached to the casing G, and which, together with the soil pipe, terminates in the well B. A branch pipe *a* communicates with the interior of the casing G, at a point near the top of the same, and to this branch is connected a ventilating pipe *d*, which may either be carried up to a suitable height outside the building, or it may communicate with a neighboring chimney or flue connected therewith. The space between the soil pipe H and exterior pipe I, also communicates with the branch *a* through a pipe *b*.

After the basin has been cleansed in the usual manner by a stream of water discharged from a coiled pipe, portions of the soil are apt to adhere to the soil pipe H, which but for the improved ventilating ar-

rangement would impregnate the air of the apartments in the neighborhood of the closet with offensive gases.

The rarefied air in the neighborhood of the closet, however, will pass down the basin and pipe F, into the casing G, and upwards through the branch *a* to the ventilating pipe or flue, the foul air from the soil pipe passing upward into the same casing and out in the same direction.

The peculiar form of the casing G, and its position as regards the pipe F, branch pipe A, and soil pipe H, facilitates the free discharge of all noxious exhalations through the ventilating pipe into the exterior atmosphere.

In order to avoid all offensive effluvia, it is necessary that the well which forms a reservoir for the soil should be effectually ventilated.

This is accomplished by the above described arrangement, as the foul gases generated in the well pass into the space between the soil pipe H and exterior pipe I, and from them to the ventilating pipe or flue through the pipe *b*.

MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

Corrections of Mr. Pirsson's Article "On the Durability of Tubes" in his Condenser. By THOMAS PROSSER, Civ. Eng.

In the current volume of this *Journal*, p. 234, Mr. Pirsson has entered upon a defence of his surface condenser, and a condemnation of *all* others, which, as mere assertions, may pass for what they are worth, unsupported as they are by any specific references.

This might not be expected from the caption of the article, but so it is, and the only exception I take, is the very debatable elaboration on surface condensers in general, and the fanciful assumption which follows.

"*Until the advent of my invention*," says the writer of the article alluded to, "want of durability in surface condensers had been the chief objection to their use;" caused by "pressure, and expansion, and contraction."

This assertion is not warranted by any single instance that I know of, in any condenser worthy of one moment's consideration. Hall's were put into a great number of vessels, and were highly extolled for years; but where are they now? I am not ignorant of the array which Mr. Pirsson can produce in favor of his condenser, but it is far inferior to Mr. Hall's, and yet, notwithstanding the almost perfect vacuum which they maintained, thereby proving that "pressure, and contraction, and expansion" had no injurious effect, and further, that they had no provision for returning to "*jet condensation*," (which "new feature" only proves to me the defective nature of the arrangement, and that it is not to be depended on,) that condenser was a failure; not from "pressure, and expansion, and contraction," but from defects inherent

in the system or principle of air pump surface condensation, which I have pointed out in former volumes of this *Journal*, and to which I invite the attention of Mr. Pirsson, with the view to the correction of any errors which he may find there.

I can name other surface condensers to which the assertion that, the "new feature upon which only may surface condensation be safely employed," does not apply, if, indeed, it does to any.

"When the tubes do give out,"—"the only difference perceivable in the working of the engine is the loss of fresh water." Exactly so; I do not see what else can happen. The condenser being for the express purpose of securing a supply of *fresh water*, when it fails, I suppose there is still the sea-water to go to. I did suppose that the additional air-pump was required on account of the extreme thinness of the tubes employed, not being able to bear the pressure of the atmosphere, but such thin tubes having failed, and thicker ones being substituted for them, I expected that the *extra* air-pump might be dispensed with, particularly as one air-pump is always troublesome enough without increasing the evil. This, however, as it appears, is not the case, and I can only imagine that it arises from the continual liability of the tubes to leak the salt water into them. If this is the case, the vacuum may well be very inferior to that which Mr. Hall's condensers maintained, and shows conclusively the value of the "*new feature;*" for the latter is recorded at 28·5 to 29·5 inches,* which exceeds any that I have seen of the former by more than 4 inches.†

It is but natural, therefore, to inquire if the waters in the boilers are ever fresh after they have consumed the supply with which they leave port? To come more directly to the point; is it, or is it not necessary to pump about 25 ℔ cent. of sea-water into the boilers to make up for waste? which waste, the patent states, is to be made up by means of an "*evaporator.*" In short, is not the "*evaporator*" a delusion? If the vapor taken from the sea-water, causes concentration in the latter, of course the "blowing off" must be resorted to, just the same as if the concentration took place in the boiler.

The original evil is the necessity of "blowing off" at all, and that has killed and will kill every surface condenser that can be constructed with an air-pump attachment.

Upon this and other important points I shall be pleased to hear from Mr. Pirsson again, but as to the minor one, about the tinning, which were mentioned incidentally and scarcely worth the trouble of noticing, (to the exclusion of the main principles involved, economy of fuel and freshness of boiler water, which are so closely connected as to be inseparable,) further developments are required.

On the durability of copper tubes, Mr. Pirsson states that "the copper tubes at present in the condenser of the *Arago* are now (September 19th,) far in the fourth year of their existence." "The same in the case of the *Fulton!*"

Now, if my statements are erroneous, I may have a good excuse for them, in the absence of published documents of authority, but Mr. Pirsson can claim no such immunity.

* Lond. Mec. Mag., vol. xxxii, p. 27.

† See vol. xxviii, p. 340, of this Journal.

The *Arago* did not commence her first voyage until 3d June, 1855,* since which time she has had a set of copper tubes put into her condensers other than those she started with, as Mr. Pirsson acknowledges. I do not perceive, therefore, that any of my statements have been corrected, except to show that the case is worse than I made it out to be.

The *Fulton* has not been to sea as long as the *Arago*, and it was not intended to put her condensers in until after the third voyage,† so that she can scarcely have been much, if any, over two years with the condensers on board.

I shall pursue the correction of Mr. Pirsson no further, but hope he will set himself right in the matter, give dates, &c., and address himself fully and fairly to the subject. A few more facts and we shall get out all that is required.

Certainly it is worth knowing, that Lake Superior copper is so utterly worthless as he represents it to be. It was supposed, however, that the tubes in the *Arago* were very thin, and that the new ones were made thicker, which may have something to do with the matter. At all events, the quality of the copper should undergo a severe scrutiny, and if inferior, it behooves the smelter to introduce more skilful manipulation.

From the manner of Mr. Pirsson, in speaking of condensers known to be leaky, I presume that he considers *that* to be the normal state of them, and I cannot but admire his ingenuity in thus getting over the old "*fogies*," who were used to consider "*tightness*" rather an essential feature in a condenser.

Mode of Preparing Liquids of given Specific Gravity, without Calculation or Previous Trials. Densimeter by M. Spacowsky.

In the laboratory and in the arts, we are often required to prepare a definite mixture of two liquids, such as sulphuric acid and water, alcohol and water, &c., one of two modes is generally employed. 1st, Given the quantity and specific gravity of one of the liquids, the quantity of the other liquid is calculated. This mode is not always practicable, requires time, and for alcoholic liquids especially, the concentration or mixture gives rise to difficulties frequently insurmountable; or secondly, areometers are floated in the liquors; but this means, which is very practicable and very much used, presents great difficulties in manufacture, owing to the various temperature of the mixtures.

A densimeter of a new form constructed by M. Spacowsky, of St. Petersburg, allows the preparation of a liquid mixture with great ease and precision, and without a thermometer.

The apparatus consists of a vessel or areometer of platina. This areometer is closed above by a very thin partition or metallic plate, such as that employed in the aneroid barometers and yielding to the fullest pressure. At its lower end the areometer is terminated by a tube fur-

* See vol. xxx, 3d series of this Journal. † Ibid vol. xxxi, p. 341.

nished with a stop-cock. It is suspended by a platina wire from one arm of a delicate balance, and equilibriated by a weight suspended also by a platina wire from the other arm. The equilibrium thus established will evidently be destroyed if the areometer be filled with any liquid, but will be restored if the areometer and the counter-balancing weight be plunged in a liquid of the same specific gravity as that which it contains; and as the thin partition allows the liquid contained to expand in accordance with the temperature to which it may be subjected, a very simple calculation will show that the re-establishment of the equilibrium is independent of the temperature. As, moreover, the metal of which the instrument is made, is very thin and a good conductor of heat, the equilibrium of temperature will soon be established between the interior and exterior liquid.

Now, to reproduce in any quantity, a liquid of given specific gravity; fill the areometer with the given liquid, and plunge it and the equilibriating weight into the heavier of the liquids to be mixed, and add the other until the equilibrium is restored. The liquids will be rigorously of the same specific gravity.—*Academie des Sciences de Paris*, 7 *June*, 1858.

For the Journal of the Franklin Institute.

Particulars of the North German Lloyds' Steamers Bremen and New York.

Hulls and machinery by Caird & Co., Greenwich. Intended service, Bremen to New York.

Hull.—

Length on deck from fore part of stem to after part of stern post,	328 feet.	
Breadth of beam at midship section, above the main wales,	40 "	2 inches.
Depth of hold,	26 "	
" " to spar deck,	33 "	
Draft of water at load line,	21 "	
" " below pressure and revolutions,	20 "	
Tonnage, 2500.		
Masts and rig—barque.		

Engines—Vertical direct.

Diameters of cylinders,		90 inches.
Length of stroke,	3 feet	6 "
Maximum pressure of steam in pounds, 25.		
" revolutions per minute, 50.		

Boilers—Four—Horizontal tubular.

Propellers.—

Diameter of screw,	17 feet.
Pitch "	30 to 33 "
Number of blades—three.	

Remarks.—Frames, shape and dimensions, ⅂, $6 \times \frac{1}{16}$ths. Distance apart, at centres, 18 inches. Keel, $11 \times 3\frac{1}{4}$ inches. Plates, thickness, $\frac{3}{8}$ to $\frac{1}{16}$th inch. 6 keelsons, $30 \times \frac{3}{4}$-inch. 5 water-tight bulkheads. Beam ties on each deck, $12 \times \frac{1}{2}$-inch. Frame ties, $2\frac{1}{2} \times \frac{3}{4}$, and 12 ins. apart.

C. H. H.

For the Journal of the Franklin Institute.

Particulars of the North German Lloyds' Steamers Hudson and Weser.

Hulls and machinery by Palmer Brothers & Co., New York. Intended service, New York and Bremen.

Hull.—		
Length on deck from fore part of stem to after part of stern post, above spar deck,	345 feet.	
" of deck,	318 "	
Breadth of beam at midship section, above the main wales,	40 "	
Depth of hold,	26 "	
" " to spar deck,	33 "	3 inches.
Diameter of shaft,		16 "
Length "	125 "	
Draft of water at load line,	22 "	
" below pressure and revolutions,	20 "	
Tonnage,	2703.	
Masts and rig—barque.		
Engines—Vertical, direct.		
Diameter of cylinders,		90 inches.
Length of stroke,	3 feet	6 "
Maximum pressure of steam in pounds,	24.	
" revolutions per minute,	50.	
Boilers—Four—Horizontal tubular.		
Number of furnaces—eight to each boiler.		
Propellers.—		
Diameter of screw,	16 feet	6 inches.
Pitch "	29 "	
Number of blades—three.		

Remarks.—Frames, shape and dimensions, ᒣ, 6 inches × $\frac{1}{2}$-inch. Distance apart, at centres, 19 inches. Thickness of plates, $\frac{5}{8}$ to $\frac{7}{8}$-in. Have 5 water-tight bulkheads. Beam ties on each deck of wrought iron. Has accommodations for 70 first class, 100 second class, and 450 steerage passengers.

C. H. H.

On Personal Equation. By Prof. Mitchel.

[Letter to the Astronomer Royal.]

At the meeting of the American Association of 1856, I announced the fact that I had contrived a simple apparatus for the investigation of the subject of "*absolute* personal equation." Sickness in my family, and other causes, have combined to prevent a full investigation of this subject until the beginning of the present year.

In case a star could be made to record the moment of its own transit, the difference between the star's record and that of any observer would be the observer's *absolute* personal equation, or what I shall term hereafter, the "personality of the eye." In like manner, in case a sound could be made to record the moment of its occurrence, the difference

between the record and that of an observer would give what I term "absolute personality of the ear." The same of the sense of touch, which, as a matter of physiological curiosity, has somewhat engaged my attention.

As the stars cannot at present be made to record their own transits, I have substituted what I call "artificial stars," moving uniformly with a velocity somewhat greater than that of an equatorial star observed with a power of 200, the power of the eye-piece now used in the transit telescope. By means of an electro-magnet, these artificial stars (ten in number) attached to my revolving disk, are made to record the exact moment at which they transit an artificial meridian line. The observer, by the aid of another magnet, records the moment of his observed transit, and the difference of these two records corrected for difference of armature and gross time of the two magnets, gives me the "absolute personality of eye."

This same quantity has been obtained also from a record of the moment at which the eye perceives a white "stripe" on a dark ground, thrown into view by the sudden action of the electro-magnetic armature, which records the moment of transit of the artificial stars. These quantities, as will be seen hereafter, are almost identical.

To obtain "absolute personality of the ear," the observer, with his magnetic key, attempts to record the moment he perceives the sound produced by the fall of the "time-pen" on the disk, as driven by the armature of the time electro-magnet, it falls, and makes its "true" dot. The interval between the dot struck by the time-pen and that struck by the observer's recording pen, corrected for value of armature time of the observing-pen, gives the time required for the ear to execute its office, and for the nerves obedient to the will to execute the record. A like process, which it is quite unnecessary to describe, gives "personality of touch."

To the practical astronomer the personality of eye and ear are alone important; to those who have adopted the American method of transits, the "personality of the eye" remains as the quantity whose value and variations it is required to determine.

Our regular observations have been continued daily, with few exceptions, through some 60 or 70 days, my assistant, Mr. H. Twitchell, and myself making an equal number of observations to determine the following quantities:—

1. Absolute personality of eye.
2. Absolute personality of ear.
3. Observed moment of transit.
4. Observed moment of emersion.
5. Observed moment of immersion.

These constitute the regular observations. Besides these, I have obtained the "eye and ear personality" of about thirty persons (not observers) of each sex, and of ages from fourteen to seventy-five years. Among these individuals I find thus far no law which seems to govern the personality. The range is small, as the personality of eye varies between the lowest limit 137 thousandths of a second, and the highest,

214 thousandths of one second of time. The personality of ear has for its least amount 137 thousandths of a second, and for its greatest limit, 223 thousandths of one second of time; and each of these limits belongs to the same two observers.

The mean personality of my own eye, as obtained from 255 observations, is 161 thousandths of a second. The mean personality of my ear, as obtained from an equal number of measures, is 164 thousandths of a second. These same quantities for Mr. Twitchell, as given by the same number of observations on the same days with my own, are for the eye, 144, and for the ear, 153 thousandths of one second of time.

My minimum "eye personality" is 139 thousandths of a second, the maximum reaches to 191 thousandths. My minimum "ear personality" is 143, my maximum "ear personality" is 193 thousandths of one second of time. The same quantities for Mr. Twitchell are for

	s.		s.
The eye, minimum, .	0·118	maximum, .	0·184
" ear, " .	0·129	" .	0·201

Having reached the above results, I was now curious to learn whether the eye and ear were steady for very short periods of time. For this purpose my assistant and myself each made five series of ten observations, each on alternate minutes, which being continued several days, showed that we were liable to a variation of "eye personality" amounting to about two hundredths of a second on the mean of ten observations. I also found that the difference already established between Mr. Twitchell and myself was confirmed in these observations.

I will simply remark, that the sense of touch gave results almost identical with those of the eye; and this fact being soon discovered, the observations for personality of touch were discontinued.

Thus far we have presented results obtained by the eye, in seizing an almost instantaneous movement, the sudden darting of a white line from behind a black screen.

When a comparison was instituted between the absolute and observed moments of transits of the artificial stars, I found, much to my surprise, that both my assistant and myself largely *anticipated* the true time; and that in every instance, without one exception, the same fact was noticed in other persons, who were ignorant of what they were doing, while recording their transits.

After learning the fact of this unconscious anticipation, efforts were made to cure the evil by special attention. To some extent this was done, but the tendency was to an immediate relapse the moment special attention was discontinued. I find (on a mean of ten observations) my own anticipations amounting to the tenth of a second of time in more than one instance, while Mr. Twitchell's error is nearly as large. The variations from day to day, and from observation to observation in the same set, were far larger than I had anticipated.

This gave rise to the observation of "emersions" of the artificial stars from behind a dark screen. Here I found a steadiness in the results precisely equal to the performance of the eye as already determined, which for my assistant and myself seems to be the highest limit of attainable accuracy.

The experiments of observed immersion exhibited the fact of a strong tendency to anticipation, and a less degree of steadiness in the work.

I now became anxious to apply the discoveries thus made in some practical manner to our star transits.

For this purpose I have constructed a diaphragm, consisting of eight occulting bars, four on each side of a central spider's line. We observe the emersion from the first bar, both immersion and emersion from the second, third, and fourth bars, the transit of the central wire, the immersion and emersion of the fifth, sixth, and seventh bars, and the immersion on the eighth bar; in this way we make fifteen observations. These bars are about two seconds of time in width, and their intervals about four seconds at the equator. By observing emersion and immersion, we hope to avoid any error arising from stars of different magnitudes, as the longer stars will emerge sooner and disappear later, a mean of the two observations giving us the place of an imaginary wire between the two bars correctly. I can only say that we have had but two nights' work with the new method. The results are highly promising, but too inconsiderable to communicate.

Proceedings of the Royal Astronomical Society, June, 1858.

Cincinnati Observatory, May 16, 1858.

Enamel without Lead on Bar and Sheet Iron. By M. Pleischl.

The author gives two recipes for the enamel, viz:—

1. Silica,	from 30 to 50 parts.		2. Quartz,	from 30 to 50 parts.	
Flint,	"	10 to 20 "	Granite,	"	20 to 30 "
Kaolin,	"	10 to 20 "	Borax,	"	10 to 20 "
Pipe clay,	"	8 to 16 "	Glass,	"	6 to 10 "
Chalk,	"	6 to 10 "	Magnesia,	"	10 to 15 "
Pulverized porcelain	"	5 to 15 "	Feldspar,	"	5 to 20 "
Boracic acid,	"	20 to 40 "	Effloresced carb. soda,	"	10 to 20 "
Nitre,	"	6 to 10 "	Lime,	"	5 to 15 "
Gypsum,	"	2 to 6 "	Sulphate of Baryta,	"	2 to 8 "
			Fluor-spar,	"	3 to 10 "

Each of these substances to be powdered separately as fine as possible, mixed carefully and fused with an enamel; this is again ground, and applied to the objects, which are then furnaced. The proportions indicated may vary very much with the different kinds of utensils which are to receive it. The coat should be thin, otherwise it will crack in heating or cooling, and the objects coated should be cooled as slowly as possible so as to prevent the enamel from shrinking irregularly and cracking.—*Bull. Soc. Encour. de l'Indus. Nat.*, (*Paris.*)

Amalgamating Zinc.

M. Berjot has just discovered and communicated to the Academy of Sciences, at Paris, what he considers a new and advantageous mode of amalgamating zinc, by a liquid formed by dissolving 200 parts of mercury in aqua-regio and adding hydrochloric acid. If he will wet his

zinc with the acid, and then rub with nitrate of mercury, he will find less trouble and equally good results. We can hardly believe that the manufacturers of galvanic batteries in France have been in the habit of amalgamating, as M. Berjot states, by immersing the zinc in acidulated water, and rubbing metallic mercury on them with a brush made of fine copper wire. If they have, they have been unaccountably behind the art, and we would recommend M. B's. process to them.

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*On the Electric Conducting Power of the Metals.** By AUGUSTUS MATTHIESSEN, Ph. D.

The following values for the conducting power of the metals were determined in the Physical Laboratory at Heidelberg, under the direction of Professor Kirchhoff, by the same method as is described in the "*Philosophical Magazine*," February, 1857.

	Conducting Power	at Temp. in Celsius's degrees.
	°	°
Silver,	100	0
Copper, No. 3,	77·43	18·8
Copper, No. 2,	72·06	22·6
Gold,	55·19	21·8
Sodium,	37·43	21·7
Aluminium,	33·76	19·6
Copper, No. 1,	30·63	24·2
Zinc,	27·39	17·6
Magnesium,	25·47	17·0
Calcium,	22 14	16·8
Cadmium,	22·10	18·8
Potassium,	20·85	20·4
Lithium,	19·00	20·0
Iron,	14·44	20·4
Palladium,	12·64	17·2
Tin,	11 45	21·0
Platinum,	10·53	20·7
Lead,	7·77	17·3
Argentine,	7·67	18·7
Strontium,	6·71	20·0
Antimony,	4·29	18 7
Mercury,	1·63	22·8
Bismuth,	1·19	13·8
Alloy of Bismuth, 32 parts, Antimony, 1 part,	0·884	24·0
Alloy of Bismuth, 12 parts, Tin, 1 part,	0 519	22·0
Alloy of Antimony 2 parts, Zinc 1 part,	0·413	25·0
Graphite, No. 1,	0·0693	22·0
Graphite, No. 2,	0·0436	22·0
Gas-coke,	0·0386	25·0
Graphite, No. 3,	0·00395	22·0
Bunsen's Battery-Coke,	0·00246	26·2
Tellurium,	0·000777	19·6
Red Phosphorus,	0·00000123	24·0

All the metals were the same as those used for my thermo-electric experiments, with the exception of cadmium, which was purified by my friend, Mr. B. Jegel.

* From the Lond., Edin., and Dub. Phil. Mag., Sept., 1858.

The alloys of bismuth-antimony, bismuth-tin, antimony, and zinc were determined in order to ascertain whether, as they give, with other metals, such strong thermo-electric currents, they might be more advantageously employed for thermo-electric batteries than those constructed of bismuth and antimony.

Coppers No. 1, 2, 3, were wires of commerce. No. 1 contained small quantities of lead, tin, zinc, and nickel. The low conducting power of No. 1 is owing, as Professor Bunsen thinks, to a small quantity of suboxide being dissolved up in it.

Graphite No. 1 is the so-called pure Ceylon; No. 3 purified German and No. 2 a mixture of both. The specimens were purified by Brodie's patent and pressed by Mr. Cartmell, to whom I am indebted for the above.

The conducting power for gas-coke, graphite, and Bunsen's battery-coke increases by heat from 0° to 140° C.; it increases for each degree 0·00245, *i. e.*, at 0° C. the conducting power = 100, and between the common temperature and a light red heat about 12 per cent. The following metals were chemically pure:—Silver, gold, zinc, cadmium, tin, lead, antimony, quicksilver, bismuth, tellurium. Those pressed were sodium, zinc, magnesium, calcium, cadmium, potassium, tin, lead, strontium, antimony, bismuth, tellurium, and the alloys of bismuth-antimony and bismuth-tin. The way in which these wires were made is described in the "*Philosophical Magazine*," for February, 1857.

For the Journal of the Franklin Institute.

Particulars of the Steamer Saxonia.

Hull and machinery built by Caird & Co., Greenwich. Owners, Hamburgh and New York Steamship Co.

Hull.—	
Length on deck,	315 feet.
" " over all,	345 "
Breadth of beam (molded),	40 "
Depth of hold,	24 "
" to spar deck,	32 "
Draft of water,	19 " 6 inches.
Tonnage,	2500.
Masts, three—rig, barque.	
Engines—Vertical, direct.	
Diameter of cylinders,	70 inches.
Length of stroke,	3 feet 6 "
Boilers—Four—Horizontal tubular.	
Number of furnaces—three in each boiler.	
Propeller.—	
Diameter of screw,	12 feet.
Number of blades—three.	

Remarks.—Frames, shape, ⅂; depth, 6 ins.; width of web, $\frac{5}{8}$-in.; width of flanches, 3 ins. Thickness of plates from keel to gunwale, $1\frac{1}{8}$ to $\frac{5}{8}$-inch. Diameter of rivets, $\frac{3}{4}$-inch; distance, $2\frac{3}{4}$-inch—single and double riveted. Independent steam, fire, and bilge pumps, one.

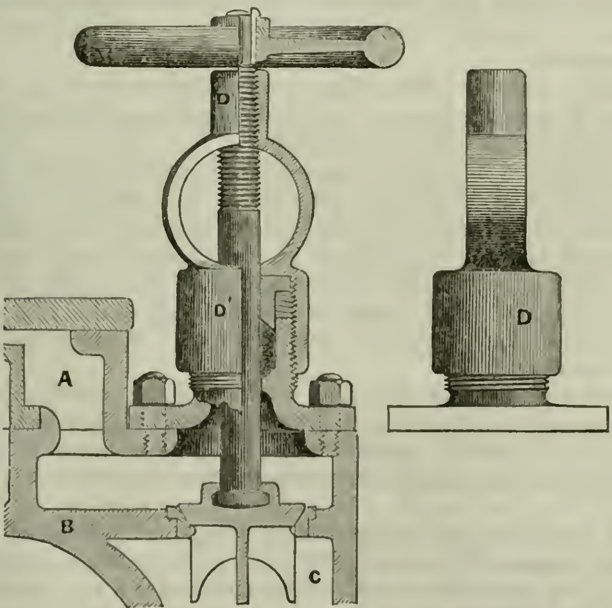
Boilers, chimney, and smoke pipe protected from communicating fire by iron and felt. 6 bulkheads. Water bottoms to boilers. Two fore and aft stringers on spar and main decks, ½-inch by 3 feet; and two (inboard), ⅝-inch by 12½ inches. Has four decks, and can accommodate 54 first class, 117 second class, and 400 steerage passengers.

C. H. H.

For the Journal of the Franklin Institute.

Combined Nut and Gland for Screw Stop Valves.

Messrs. I. P. Morris & Co., Port Richmond Iron Works, have lately applied to their screw stop valves, a neat and inexpensive substitute for the arch or column and cross-head, generally used to hold the nut for the thread on the stem. The arrangement, which was designed by Mr. Lewis Taws, the engineering member of the firm, will be seen in the cut below, in which it is shown as adapted to a horizontal steam engine; A, B, C, being parts of the steam-chest, cylinder, and passage from the steam supply pipe; and D D′ a brass nut for the screwed stem of the valve, as well as that required for forcing down the gland in the stuffing-box, the threads in both being of the same pitch to prevent jamming when screwing down the packing with the valve seated.



The mechanic will observe readily the ease with which the nut can be finished, and the certainty of all the parts being in line with each other, as all the work can be done in the lathe.

Screw-valves are often fitted with a thread and nut between the valve

and the stuffing-box, but then those parts cannot be lubricated, and are in contact with the steam; consequently they quickly wear and corrode. These serious defects are avoided by the plan shown in the cut.

The shape of D D′ may be varied to suit the taste; it is important, however, that somewhere between the nuts, D and D′, apertures should be made for the escape of any steam leaking through the stuffing-box, so as not to compel it to pass through the nut, D, thereby rusting out the thread. J.

Danger of Telegraph Wires in the Vicinity of Depôts of Gunpowder. Report of a Committee of the Academy of Sciences of Paris.

M. le Marechal Minister of War, wrote to the Academy for the purpose of consulting it on the question whether the passage of telegraph wires in the vicinity of a powder magazine could be a source of danger. The committee appointed to prepare a report on this subject, submit it for the approbation of the Academy.

It considers as certain, that the electric currents developed in the telegraph wire for the usual transmission of despatches can never produce accidents; for supposing even that the wires should be broken during the transmission, either by the wind or by any other cause, the small sparks which might appear at the points of rupture would be insufficient to inflame the floating powder-dust, resting on the wires or on their supports.

But it is altogether different in regard to the atmospheric electricity; its action frequently becomes formidable, and would be an imminent cause of danger for powder-magazines.

If, for instance, it should happen that lightning should strike the telegraph wires, it is probable they would be fused for a certain distance, inflamed and dispersed, and that the incandescent globules might be dispersed very far by the force of the explosion, and still farther by the wind; moreover, the free ends of the wires in full combustion, and urged by the same causes, would not fail to describe extensive curves around their points of attachment and to carry the flames to great distances.

Were this probability even only a possibility, it would be nevertheless indispensable to guard the powder magazines against such a danger.

After having passed in review the various precautions to which recourse might be had, the Committee recommend the following arrangements.

1. To substitute underground wires along that portion of the line which is less than 100 metres (100 yards,) of a powder magazine.

2. To keep the underground track outside of the zone within which it would be dangerous to admit the workmen required to construct, examine, or repair it.

3. To establish one or more lightning rods, upon poles of 15 or 20 metres (50 to 65 feet,) in height, near these underground wires, so as to protect their whole length against the direct stroke of the lightning.

They propose to the Academy to approve of these depositions, which appear to us to be the most suitable to give every security to the administration of war, without imposing too great a tax on the administration of the telegraphs.

COMMITTEE.—*MM. Becquerel, Regnault, Despretz, de Senarmont, Marshal Vaillant Pouillet Reporter.*

After some explanations given by the reporter in answer to remarks of MM. Le Verrier and Piosert, the Report was adopted.—*Comptes Rendus, August* 16, 1858.

[We do not know that any objection can be taken to the principal recommendations of the above Report, although they will be entirely useless for powder magazines, (for which it appears they are intended,) since we see no reason for supposing powder dust to settle on the wires, or to be suspended in the air near magazines. Near powder-mills, no doubt there is utility in the suggestion. As to the lightning rod, direct experience has demonstrated their danger unless they be connected with the metallic masses which form part of the magazines. If there be, for instance, an iron magazine, or one in which iron beams or metal roofing are used, the danger from the vicinity of the lightning rods near enough to excite induction, but not metalically connected with it, will be far greater than from any telegraph wire. ED.]

Water-proofing Stuffs.

Take a pound of gelatine, and a pound of neutral tallow-soap; melt them in $4\frac{1}{2}$ galls. of water, and add little by little $1\frac{1}{2}$ lbs. alum; continue to boil for a quarter of an hour; wait until the milky-looking liquid has come down to 113°, then plunge the stuff into it, allowing it to become well soaked. Take it out, let it drip, and dry it completely by hanging it up without wringing; wash it carefully, dry it again, and calander it. The soap must be made with tallow, for no other fatty matter will remain suspended in the gelatine.—*Bull. Soc. Encour. de l'Indus. Nat.*, (*Paris.*)

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*Process for Decolorizing the Fatty Oils.** By C. BRUNNER.

As in all the fatty oils which he treated, the author remarked, that after the evaporation of the ether, they were obtained of a much lighter color than when first employed, in some cases even perfectly limpid, he endeavored to discover a general process for bleaching the fatty oils in this way. This object was completely attained in many cases by proceeding as follows:—

The oil is made into an emulsion with water, to which the proper consistence is given by gum or starch-paste, and this emulsion is well worked up with thoroughly ignited charcoal, coarsely powdered and freed from fine dust by sifting. To 1 part of oil about 2 parts of char-

* From the London Chemical Gazette, No. 381.

coal powder are taken. The doughy mass is allowed to dry thoroughly at a temperature which should not exceed 212° F., and the oil is subsequently extracted with ether in the cold in a displacement apparatus. After this extract has deposited any charcoal powder that may have passed through during the extraction, it is put into a retort, and the ether is distilled off in the water-bath. In this way olive oil and walnut oil are completely deprived of color.

It might perhaps be supposed that the charcoal has a direct decolorizing action in this case upon the oil, just as in many cases it clears many aqueous fluids. This, however, is not the case. Oils left in contact with charcoal for weeks together did not undergo the least decolorization, even when they were dissolved in ether and digested with charcoal. The presence of the water contained in the emulsion appears first to give rise to the action. It is probable that by the preparation of the emulsion, the coloring matter, which does not belong to the oil itself, is taken up by the water and afterwards absorbed by the charcoal.

The action may be similar to that set up in the operation employed by painters to bleach oils, which consists in agitating the oil sufficiently with an equal volume of water, and exposing the mixture to the sun. The water, which soon separates again from the oil, appears turbid, and often mixed with slimy flakes. The operation is repeated for weeks, the water being frequently renewed, until it is no longer rendered turbid, and the oil appears limpid.

In the above process the essential part appears to be the complete desiccation of the charcoal mixed with the emulsion. If the oil be extracted with ether before this is the case, it is obtained again with its original color.

Lastly, it is to be remarked that by this process the oils undergo a very remarkable thickening. Thus walnut oil is obtained nearly of the consistence of butter.—*Bremer Mittheilungen*, Dec. 1857.

Mode of Preserving Photographs on Paper. By M. Gaudinet.

"I dissolve a certain quantity of the gutta percha of commerce in the *Colas* benzine. I decant in a few days, so as to have only the clear portion. I plunge my paper, sheet by sheet, in this solution, and withdraw it almost immediately; then hanging it by a corner, I let it dry. I then present these sheets which contain the gutta percha as a powder, but not as a varnish, to a good fire. The grains of gutta percha unite, and cover the fibres, forming an interior varnish which is nearly impermeable.

I albuminize this paper which has lost none of its transparence (albumen, 100; rain-water, 25; chloride of sodium, 6). I dry it, and render it sensitive by a solution of 15 ℔ cent. of nitrate of silver. I allow it to drip, and dry it by a gentle fire; I produce a positive in the usual way, and fix it by hyposulphite of soda at 10 or 15 ℔ cent.; but this operation is so much abridged, that in a few minutes the proof is fixed

like one on glass, and of a beautiful sepia tint. Nothing prevents the use of chloride of gold if that is desired. The washing may be done in a quarter of an hour, in place of lasting from 12 to 24 hours, and the proof is of admirable transparence, the paper also keeping all its whiteness.—*Comptes Rendus de l'Acad. des Sciences de Paris.*

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*On the Amount of Caffeine in Coffee-beans** By Prof. A. Vogel, Jr.

The method hitherto employed for the extraction of caffeine from coffee beans or tea leaves, is both complicated and uncertain. It consists in extracting the coffee beans with water, precipitating the tannic acid from the solution by lead salts, and evaporating only the solution freed from lead for crystallization. This method is exceedingly inconvenient, and this is probably the principal reason why the statements as to the amount of caffeine in coffee differ so much from each other.

The following method appears to the author to be much simpler and to lead to more accurate results. It is founded on the treatment of powdered coffee beans with commercial benzole. This extracts two constituents from the coffee—oil of coffee and caffeine. After the evaporation of the benzole, these two substances may be easily separated from each other by agitation with hot water, in which the caffeine dissolves, whilst the oil floats on the surface and may be skimmed off. The caffeine is obtained by the evaporation of the aqueous solution, in very beautiful crystals, which may be sublimed.

The whole of the benzole may be recovered, by distilling it in a retort, after it has stood about a week upon the coffee beans. The residue in the retort is the oil of coffee and caffeine, which may be separated as above by agitation with water, or by treatment with ether, which dissolves the oil and leaves the caffeine in crystals. By this method oil of coffee and caffeine might be obtained as subsidiary products in benzole manufactories.—*Kunst-und Gewerbeblatt für Bayern*, 1858.

* From the London Chemical Gazette, No. 377.

Destruction of Insects.

M. Millot Brulè exhibited before the Imperial Central Horticultural Society, of Paris, the efficacy of the powdered proto-sulphuret of iron, (which has been before used for the preservation of timber,) in destroying noxious and annoying insects.

The powder may be strewed over the ground around the roots of the tree, or fixed on the surface of a collar surrounding the stem: no insect will pass it, or if they attempt it they are immediately killed. The proto-sulphuret of iron (black pyrites,) occurs as a mineral in various parts of France and Germany, and is manufactured for the purpose of developing sulphuretted hydrogen, which is undoubtedly the effective agent in destroying the vermin.—*Cosmos.*

Abstract of Meteorological Observations for August, 1858; made in Philadelphia, Somerset, Bedford, and Huntingdon Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

August, 1858.	PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.								
	Barometer.		Thermometer.			Relative humidity.	Force of vapor.	Rain.	Prevail'g winds.
	Mean.	Mean daily range.	Mean.	Daily oscillation.	Mean daily range.	2 P. M.	2 P.M.		
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	
1	29·742	·057	78·2	12½	2 5	48	·550		(var.)
☽ 2	29·809	·067	71·5	13	8·7	78	·624	0 995	E.
3	29·835	·059	70·5	10½	5·0	80	·631	0·010	E.
4	29·753	·082	79·0	14	8·5	71	·832	0·008	(var.)
5	29·751	·006	81·7	18	2·7	58	·785		WSW.
6	29·782	·031	82·3	17	2·0	45	·601		N W.
7	29·859	·074	78·5	12½	4·8	45	·525		NNW.
● 8	29·932	·073	77·2	14	1 3	40	·468		NNE.
9	29·912	·050	75·0	17½	2·2	37	·432		N E.
10	29·796	·115	77·8	19	2·8	53	·622		(var.)
11	29 742	·054	79·8	18½	4·0	57	·770	1·155	S.
12	29·834	·092	79·0	16	3·5	69	·780	0·002	N E.
13	30·011	·177	75·0	10½	4·0	55	·584		N E.
14	29·977	·078	72·3	8	3·7	64	·554		N E.
15	29·784	·192	76·3	16	4·0	56	·609		(var.)
☾ 16	29·886	·098	79 7	21½	3 3	52	·690		S W.
17	29·910	·057	78·5	20	3·5	50	·706	1·018	S W.
18	29·678	·233	80·7	18½	3·2	64	·860	1·218	S W.
19	29·682	·116	68 8	18	11·8	47	·395		N W.
20	29·852	·170	68·0	24	7·2	52	·469		N W.
21	29·823	·029	77·2	15	0·2	61	·655	0·023	S W.
22	29·701	·052	74 7	11	3·2	47	·464		W.
23	29·969	·175	65·0	16	0·7	40	·319		N W.
○ 24	30 019	·050	67·2	23	3·2	46	·408		S W.
25	30·064	·045	71·7	20	4·5	44	·450		(var.)
26	30·036	·050	71 3	19	2·3	43	·429		S E.
27	29·815	·221	74·7	19	3·3	51	·522		S E.
28	29·599	·216	76·3	8½	3·0	82	·785	0·728	S E.
29	29·617	·041	72·2	15	5·2	47	·475		W.
30	29·662	·040	70·3	17	2·5	56	·504		W.
☽ 31	29·789	·127	73·2	16½	2·5	55	·560		S W.
Means	29·829	·095	75·0	16	4·4	55	·583	5·157	N77½W

August, 1858.	SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.					
	Bar.	Ther.	Relative humidity.	Force of vapor.	Rain.	Prevail'g winds
	Mean.	Mean.	2 P. M.	2 P.M.		
	Inch.	°	Per ct.	Inch.	Inch.	
1	27·619	72·3	59	·649	0·493	W.
☽ 2	27·616	73·0	71	·772	0·147	W.
3	27·613	72·3	72	·723	0·093	var.)
4	27·619	74·0	63	·689		W.
5	27·687	76·3	75	·876	0·024	W
6	27·717	74·7	58	·669		W.
7	27·744	71·3	50	·541		N.
● 8	27·771	72·3	56	635		S E
9	27·738	73·7	58	·718	0·008	N.
10	27 672	76·0	55	·733	0·021	N W.
11	27·646	76·3	58	·747		(var.)
12	27·736	74·0	75	·815		(var.)
13	27·845	72 0	58	·573		E N E.
14	27·800	69·7	47	·464		E.
15	27·668	69·0	63	·689		W.
☾ 16	27·741	70·7	63	689		WNW
17	27·747	71·3	50	·608		W.
18	27·597	71·7	44	·530	0·141	W.
19	27·583	64·7	52	·448		N W.
20	27·632	66·0	49	·456		S W.
21	27·680	71·3	66	·703	0·113	W.
22	27·711	63 3	47	·335		N W.
23	27·833	55·3	48	·300		N.
○ 24	27·815	59·0	51	·4·8		W.
25	27 815	64 0	45	·421		S.
26	27·758	69·7	46	·457		S S E.
27	27·579	68·7	63	·531	0·073	(var.)
28	27·439	67·0	62	·488	0·211	W.
29	27·455	61·0	37	·244		W.
30	27·531	57·0	76	·380		W.
☽ 31	27·651	59·3	74	·489		W.
Means	27·679	69·0	58	·574	1·324	

August, 1858.	BEDFORD, Bedford Co. SAMUEL BROWN, Observer.			HUNTINGDON, Huntingdon County. JACOB MILLER, Obsr.			
	Bar.	Ther.	Prevail'g winds.	Bar.	Ther.	Rain.	Prevail'g winds.
	Mean	Mean.		Mean.	Mean.		
	Inch.	°		Inch.	°	Inch.	
1				29·242	73·3	0·367	N.
☽ 2	29·026	77·3	(var.)	29·248	71·3	0·276	N.
3	29·044	73.3	S W.	29·247	70·3	1·104	W.
4	29· 00	75·3	S W.	29·192	77·3		W.
5	29·061	80·0	W.	29·248	78·7	0·058	W.
6	29·110	78·0	N W.	29·318	76·7		W.
7	29·132	78 7	N W.	29·364	75·7		N.
● 8				29 401	72 3		S.
9	29·151	75·3	N W.	29·335	74·3	0·053	S.
10	29·072	78·3	N W.	29·280	75·3	0·194	(var,)
11	29 033	77·0	N W.	29 216	79·3		W.
12	29·138	75·7	N W	29·334	76·3		N.
13	29·278	74·7	(var.)	29·502	75·7		(var.)
14	29·240	70·8	S E.	29·455	72·3		S E.
15				29·298	72·0		(var.)
☾ 16	29·150	72·7	N W.	29 357	74·3		W.
17	29·134	73·3	N W.	29·350	74·3		W.
18	29·975	75·0	N W.	29·153	75·0		(var.)
19	28·091	66·7	N W.	29·202	66 0		(var.)
20	29·069	71·0	N W.	29·262	68·0		W.
21	29·071	74·7	S W.	29·287	72·7		W.
22				29·334	68·0		N W.
23	29·292	60·3	N W.	29·511	59·7		N.
○ 24	29·255	61 0	N W.	29·481	60·0		N W.
25	29·296	66·3	N W.	29 501	66·0		W.
26	29·192	68 7	(var.)	29·435	70·3		S.
27	28·999	67·0	S W.	29·187	71·7	0·040	S.
28	28·863	71·0	S W.	29·049	71·7	0·112	W.
29				29·090	65 0		W.
30	28·941	67·3	N W.	29 138	66·0		W.
☽ 31	29·067	65·7	N W.	29·289	66·0		W.
Means				29·300	71·5	2·204	

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

DECEMBER, 1858.

CIVIL ENGINEERING.

*Locomotive Boiler Explosion at Sharp, Stewart, & Co.'s Works.**

On reference to our "Notes and Novelties," mention will be found of a fatal boiler explosion which occurred on the premises of Messrs. Sharp, Stewart, & Co., the eminent locomotive builders, Manchester, whilst they were testing the boiler and machinery of an unfinished locomotive engine, and by which the life of the highly talented and much respected manager of the works, Mr. Thomas Forsyth, was sacrificed; as also the lives of several others who were present.

Mr. William Fairbairn having been requested by the coroner to examine the boiler and report thereon, and as to the cause of the accident, has reported at great length, with his usual ability and care; and as his report contains all the more important details concerning the boiler and connected with the accident, we have given it below *in extenso*.

There is one material point with which Mr. Fairbairn has not dealt, although he has slightly alluded to it, which we think deserves especial attention by engineers: we refer to the defects in the practice of punching and riveting plates.

During a discussion which took place some time ago at the Institution of Civil Engineers, Mr. Edward Humphrys, whose extensive practical experience entitles his opinion on any practical scientific question to the highest respect, called attention to the prejudicial effects which arise from the defective construction of punches and bolsters, and from the subsequent employment of the more powerful means of riveting by

* From the London Artizan, August, 1858.

machinery which are frequently adopted. If we remember aright, and our recollection is aided by some remarks which have been made upon this subject by Mr. Charles May, C. E., the observations which were made by Mr. Humphrys to which we allude, went to show clearly enough that the edges of plates prepared for riveting, and afterwards riveted, were very materially weakened from two causes—first, from the punch employed being smaller than the hole in the bolster; and being round at the point and taper, it very materially strains the iron surrounding the hole, particularly in the direction of the line of the row of rivets, and leaves the holes smaller in diameter than the punch with which it has been pierced; and secondly, by the employment of steam riveting machines the edges of the plates are further weakened; and the mischief which has been produced by these two causes has become more difficult of detection, because joints so made are much neater, closer, and more uniform, than where hand riveting is employed.

Now, this subject requires the serious attention of boiler makers, and it will be well for them to resort to other and more accurate and powerful means of judging of the state or condition of work produced in the course of punching and riveting up boiler plates. We have had within the last few days presented to us some specimens of plate-iron joints, which, after being subjected to the most rigid examination by experienced boiler makers, were pronounced as not to be excelled; but upon filing off the outer surface of the over-lapping edge of each plate, a powerful lens at once exhibited the greatly strained and weakened condition of the metal between the rivet holes, and upon applying acid, the better to develop the structure of the iron, the distortion—indeed, the disintegration of the metal at the edges of the plates was made plainly visible without the use of a lens; and as this specimen is a type of the most approved joint-making for boiler purposes, we need scarcely add, that however good originally the whole of the plates might have been, and indeed the body of the plates appeared to be at that time, notwithstanding the appearance presented by the edges, a boiler constructed of such plates with such joints, would have been torn asunder at the rivet holes by a pressure somewhere between 100 and 200 ℔s. per square inch, instead of being able to withstand an internal pressure of 480 to 490 ℔s. per square inch, which a boiler constructed of plates of the same thickness and quality would have done, if the plates were in other respects unimpared.

With these observations, we proceed to give an authentic verbatim copy of the report prepared by Mr. William Fairbairn, F. R. S., C. E., who had been appointed by the coroner to make an examination of the remains of the boiler:—

Mr. Fairbairn said, the inquiry into the causes of this lamentable accident is surrounded with more than usual difficulty. The apparent contradiction of the facts—on the one side, the lowness of the pressure, the satisfactory condition of the safety-valves, the entire newness and supposed strength of the boiler, and on the other, the terrible destruction of human life—renders this explosion especially remarkable in the

remarkable records of such events. In pursuing my investigation, two separate and distinct subjects forced themselves on my attention:—First, whether there had been any excessive pressure of steam in the boiler sufficient to occasion rupture, had everything been sound; second, whether the material of which the ruptured part of the boiler was composed was defective in its manufacture, or had been accidentally injured in its subsequent working. To one of these two causes—either an over accumulation of force in the interior of the boiler, or a defective plate, must be attributed, in my opinion, the unfortunate casualty under consideration. In regard to the former, there is the evidence of persons who were present from the commencement of the testing until the explosion, to show that the steam was blowing off at both safety-valves during the whole time the engine was standing, and that the balance springs and the Schaeffer's gauge indicated a pressure of 117 lbs. to 118 lbs. on the square inch. I have examined with great care the whole of the valve mountings, and find that the boiler had two safety-valves, $4\frac{3}{8}$ths inch in diameter, screwed down by levers 38 inches long to spring balances, which indicated the pressure per square inch in atmospheres. The distance from the fixed end of the lever to the valve, was 3·54 inches, and from the fulcrum to the end, 34·58 inches, which gives a leverage upon the valve of about 10·7 to 1. The lever and spring balance have been carefully tested, and I find a discrepancy of 9 lbs. per square inch between the actual pressure in the boiler requisite to lift the valve and that indicated by the balance; or, in other words, when the balance was screwed down to seven atmospheres = 105 lbs. per square inch, the actual weight upon the valve was 114 lbs. This excess of strain beyond the indicated pressure is not due to any defect in the spring balance itself, but to the weight of the valve and lever not having been allowed for in the scale graduated upon it. The greatest pressure at which the engine was intended to work was eight atmospheres = 120 lbs. on the square inch: and the balance itself was graduated to indicate that pressure and no more. At the ordinary working pressure of seven atmospheres, there was a range or lift for the end of the long arm of the valve lever of $2\frac{1}{8}$ inches, and this permitted a corresponding lift of $\frac{2}{10}$ths of an inch in the valve itself. This rise opened an annular space equal to $2\frac{1}{4}$ square inches, or a total of $5\frac{1}{2}$ square inches for the two valves, equivalent to a pipe of $2\frac{5}{8}$ inches in diameter.

At this point the question arises whether or no an outlet of $5\frac{1}{2}$ square inches was sufficient to carry off the excess of steam as fast as it was generated in the boiler? To this question I would reply—Judging from the immense velocity with which steam at so high a pressure issues from an aperture, and from a knowledge of the daily and usual working of locomotives whilst standing on railways—that the area of opening was amply sufficient, and it therefore follows (the safety-valves being in every respect efficient and excellent in construction) that the accident did not arise from excessive pressure in the boiler. I am further confirmed in this opinion from the fact that the Schaeffer pressure gauge, which I tested after the accident with water pressure, was found

quite uninjured, and invariably returned to zero after frequent pressures had been applied. We have now to inquire how far the boiler itself was calculated to ensure safety. So far as the proportioning of the parts and the thickness of the plates are concerned, there was no defect; and it can be demonstrated, that supposing the material perfect and the riveting sound, the boiler was adequate to resist a force of at least 500 lbs. per square inch. To show this, I have appended the formula for calculating the strengths, and I may observe that I have also found, as the result of a series of careful experiments, that the ultimate tensile resistance of boiler plates is as given in the following table*:—

	Mean breaking weight in the direction of the fibre in tons per square inch.	Mean breaking weight across the fibre in tons per square inch.
Yorkshire plates, .	24·765	26·763
Derbyshire plates, . .	21·780	18·650
Shropshire plates, .	22·826	22·000
Staffordshire plates, .	19 563	21·010
Mean, . . .	22·519	23·037

The mean strength of boiler plates varies, therefore, from 20 to 25½ tons per square inch. The plates in the exploded boiler being properly proportioned to its size, and the workmanship being everywhere excellent, there remains, in my opinion, but one other alternative to account for the explosion: the presence, somewhere or other—in all probability

* It can be easily shown (see "Useful Information for Engineers," page 39) that if—

d = internal diameter of boiler;
l = length subjected to bursting pressure;
l' = length after deducting part punched out for the rivets;
P = the bursting pressure;
c = the thickness of the plates; and
T = the tenacity of the material;

Then the pressure of the steam to produce longitudinal rupture $= d, l, P$. The resistance opposed to this strain is evidently the area of material in the longitudinal section multiplied by its tenacity, $= 2\ c,\ l',\ T$. Now, at the moment of rupture the bursting pressure is equal to the resistance of the material; that is, $d\ l\ P = 2\ l'\ c\ T$; or,

$$P = \frac{2\ l'\ c.\ T.}{d\ l} \quad . \quad . \quad . \ (1)$$

Now, in the boiler under consideration, taking the measurements given upon the drawings of the engines; —$d = 51$ in.; $l = 37{\cdot}7$ in.; $l' = 20{\cdot}6$ in.; $c = 0.5$ in.; T = the tenacity of the material we may take at, at least 20 tons, or 45,000 lbs. per square inch. Hence, in this case—

$$P = \frac{2 \times 20\ 6 \times 0{\cdot}51 \times 45{,}000}{51 \times 37{\cdot}7} = 480 \text{ lbs.}$$

Or, in other words, 480 lbs. per square inch is the pressure requisite to burst a boiler of these dimensions. But it is to be observed, that the crossing of the joints in a locomotive boiler increases to some extent its power of resistance. If we take for the tenacity of the plate 4·667 tons per square inch, or the lowest result arrived at in the experiments on the exploded plate, we get as above, for the bursting pressure of the boiler—

$$P = \frac{2 \times 20{\cdot}6 \times 0{\cdot}51 \times 10{,}450}{51 \times 37\ 7} = 113 \text{ lbs.}$$

A very remarkable approximation to the alleged pressure in the boiler.

unseen and not discoverable—of weakness in the plate itself. The following experiments upon pieces cut from the exploded plate, appear to strengthen this opinion, and enable us to compare its powers of resistance with the above standard of quality. The experiments were carefully made, and it will be found, that although one of the recorded experiments gives a full average tensile strength, and leads me to infer that the iron of the body of the plate was good, yet the weak powers of resistance exhibited by the other experiments, especially No. 1, indicate the presence here and there of what I may call patches of inferior iron, and show that the plate was not of uniform strength throughout:

Experiment 1.—Breaking weight per square inch of iron drawn asunder, across fibre, 10,456 lbs. = 4·667 tons.

Experiment 2.—Breaking weight per square inch of iron drawn asunder in the direction of the fibre, 45,057 = 20·114 tons.

Experiment 3.—Breaking weight per square inch of iron drawn asunder across fibre, 31,038 lbs. = 13·852 tons.

Now, it is evident from the above, that a plate which yielded to a force of only one-fifth of what it should have sustained, had some of its parts very deficient in strength, and this result is confirmed by the fact that this defect of strength in the plate corresponds precisely with that which would have been anticipated from the bursting pressure of the boiler. The snapping asunder of the plate, in the first experiment, with a weight of 4½ tons to the square inch, was quite unlooked for; the fracture, however, on careful examination, appeared sound, and it must be inferred that this end of the plate contained some original and unseen imperfection, such as I have before alluded to; and that in *that* part of the iron was what is technically called burnt or red short. In explanation of such defects of manufacture, we have only to refer to the acknowledged difficulties which iron makers have to encounter in rolling plates of large dimensions. There is considerable danger of the ends becoming defective, and this happens with the very best makers. It is a mistake, therefore, to suppose that increased strength is invariably obtained by lessening the number of joints in boiler constructions. Such practice is accompanied by the risk of a want of uniformity in the strength of the material. A similar objection applies to very thick plates, which are seldom of the same tenacity as thinner ones, the latter being, in fact, much better adapted for boiler making in general, not only from their superior strength and soundness, but from their superior conducting powers in the transmission of heat.

There is another rather prevalent custom which I consider it my duty to caution the public against, now that they are fully alive to the necessity of obtaining increased security against these explosions. It is a frequent practice to purchase boilers by weight, and amongst the uneducated and unreflecting, the apparently natural, but very illogical deduction is made, that the more they get for their money the better. Now, the contesting after the cheapest rate per ton in purchasing a boiler, is destructive of every sound principle which should be studied in their construction, for the maker, often acting under the influence of a keen competition, is tempted to offer low terms and make up the

deficiency by thicker plates and increased weight; and the result is, that the purchaser often pays more for his boiler of increased weight than he would for one of superior strength of thinner plates. I make these observations for the interest of all, and especially those who erroneously suppose they are consulting economy in such bargains. Reverting to the accident under consideration, it is impossible to state with certainty what part of the joint first gave way to the force of internal pressure; but I am inclined to think that the first rupture occurred in the line of rivets next the smoke box, and close to the corner of the longitudinal joint, as it was at this point of the plate that the weak part was found which yielded to the comparatively small force of $4\frac{1}{2}$ tons to the square inch. Assuming this part to have contained from the first such an element of weakness, it will at once account for the fracture at a comparatively low pressure. Moreover, it is stated that the shock of the explosion forced back the whole mass of the engine, in the direction of its length, upwards of 30 feet; showing that the first rush of steam out of the boiler must have been in the direction of the smoke-box, and that the longitudinal movement of the engine was due to the recoil.

In conclusion, I have to state that I cannot attach blame of any kind either to the manufacturers of the plates or to the makers of the engine. A similar accident might have taken place in my own or any other works. We are subject to such casualties at all times, and although I do not say it would be *impossible* to discover certain elements of weakness in the materials of which the locomotive engine and other constructions are composed, yet with all the ordinary precautions, such as are used at the Atlas Works and all other well conducted establishments, it may happen that a hidden source of mischief may escape detection, and that we may have to deplore such an event as has occasioned this inquiry. WM. FAIRBAIRN.

For the Journal of the Franklin Institute.

The Barometer as an Engineering Instrument.

By JOHN M. RICHARDSON, B. S.

(Continued from page 313.)

Thus far the results given by the level have been regarded as absolutely correct, and those obtained by the barometer as subject to error. But, after the comparisons which have been made, the question very naturally arises, which instrument gives the most reliable results? The question cannot be decidedly answered at present. Theoretically, both the instruments give correct results, but each is subject to numerous errors. The chief sources of error in the case of the level are: (1) construction; (2) adjustment; (3) observation; (4) refraction; (5) dew-point, as affecting refraction; (6) unequal expansion and contraction of the parts of the instrument; (7) curvature of the earth.

The errors arising from (1), (2), and (3), can be reduced to their minimum by careful selection, adjustment, and observation; those arising from (4), (5), (6), cannot perhaps, in practice, be avoided; that pro-

duced by (7) can be partially corrected. The principal causes of error in the use of the barometer are eight, viz: (1) construction; (2) adjustment; (3) observation; (4) dew-point, as affecting pressure of atmosphere; (5) unequal expansion and contraction of parts of instrument; (6) changes of temperature, as affecting pressure of atmosphere; (7) agitation of the upper strata of the atmosphere, currents, &c.; (8) daily variation.

Errors arising from (1), (2), (3), as in the case of the level, can be reduced to their minimum by careful selection, adjustment, and observation; those arising from most of the others can be corrected, but they are usually small; and, regarding the barometer as an engineering instrument, they would not perhaps be corrected, except the one due to changes of temperature.

The adjustment of the level is a complex and tedious operation, and requires so much time that it cannot be done before every observation. Hence an error of adjustment may exist for some time before it is discovered. The adjustment of the mercurial barometer is simple, requires but a moment, and has to be made before each observation. The liability to error of adjustment in the case of the barometer, is not so great, then, as in the case of the level; but an error of adjustment of the former, although small, will probably cause a much greater error in the determination of differences of altitude, than an error of adjustment of the latter.

An error of observation with the level will usually vary the result but little; but, as a very small change in the height of the mercurial column corresponds to a considerable difference of level, a slight error of observation with the barometer may introduce a very material error in the final result. Upon the whole, then, taking into consideration the other errors, as well as those to which allusion has been particularly made, the liability to error on the part of the level appears to be less than on the part of the barometer. Everything, however, will depend upon the care and skill of the observer; care in avoiding errors, and skill in eliminating those which cannot be avoided.

From this view of the relative liability to error on the part of the two instruments, and the examination of observations made with them, it follows, that although the level is probably the most correct, yet the barometer, when carefully used, will be a valuable auxiliary to the engineering profession.

It is to be hoped, however, that more comparative observations will be made with the two instruments; and it is respectfully suggested to scientific gentlemen who may visit Black Mountain, or who may have opportunity to do so at any other mountain, to run carefully a line of levels from the foot to the summit, driving a stake at every station corresponding to a change of level of fifty or one hundred feet, and at every station so determined, to make careful barometric observations. The results thus obtained would probably be of great value, and would determine whether or not *the barometer-differences of altitude are too great within certain limits, and too small within others.* Some of the results of the observations quoted from the report of Lieu-

tenant W., appear to indicate the possibility of this being the case; if it is, and extended observations can alone determine it, the limits between which the barometer-altitudes are too great or too small, can, and should, be determined.

This paper has grown under the hands of the writer into a length much greater than he anticipated, when he commenced it; and the subject will be dismissed, after making some general observations upon the method of conducting a barometric survey, and giving a few formulas, tables, &c.

According to Biot and others, in order to determine the difference of level of two stations by means of the barometer, *simultaneous observations* should be made at them: but this does not appear to be strictly necessary; for, besides the trouble and expense of having two sets of instruments and two observers, if the stations are sufficiently near for the same atmospheric conditions to prevail at them, they will hardly change during the time required for an observer to record his observations at one and pass to the other. If the stations are too far apart for the same atmospheric conditions to prevail at them, it is evidently unnecessary for the observations to be simultaneous.

How far, north and south, east and west, do the same atmospheric conditions prevail? Has observation determined it? It is believed not. Here is a fruitful and valuable field for investigation. If two stations are separated by a considerable distance, and particularly if rivers, swamps, forests, chains of hills, mountains intervene, it appears to be very improbable that the same atmospheric conditions, temperature, amount of moisture, clouds, winds, &c., &c., should prevail at them; and in order to apply the correction for horary variation, it is only necessary to know the time of each observation.

In making a survey, however, it will be best to compare only those observations which have been made under pretty much the same atmospheric conditions. Thus, although it might do to compare together those observations made on a cloudy, or a windy, or a fair and still day, it would not do so well, perhaps, to compare those made on a cloudy day with those on a fair day; or those made on a windy with those on a still day, &c. Hence, having concluded the survey for one day, the survey for the next day should commence at the last station of the previous day's survey. Connecting the different days' work together in this manner, the final result, or difference of level of the two extremities, as determined by this chain of observations, should agree essentially with the result obtained by comparing together the independent observations made at the two extremities. Thus the barometer furnishes a check upon the observations made with it at intermediate stations.

It is advisable that barometrical surveys should be made during fair and calm days only; and as the observations require but little time comparatively, and as they need be taken only where there are considerable changes of level, an engineer can so select his time as to execute the survey in good weather.

Travelers usually employ the "Mountain Barometer" (mercurial)

for the determination of the altitudes of mountains, and for engineering purposes, it is perhaps the best also. But the "Aneroid" is so portable and convenient, and requires such little time for making observations, that, on these accounts, it is preferable to the mercurial. The difference between the two is at most but little, and the "Aneroid" is constantly approaching nearer and nearer to perfection. As bearing upon the relative accuracy of the mercurial and Aneroid barometers, the following mean result of fifty-six comparative and simultaneous observations made upon them by Belville, of the Royal Observatory, Greenwich, England, is given: Mercurial, 29·61; Aneroid, 29·59. Twenty of the observations agreed exactly. The greatest difference was ·03, and it occurred only three times.

Formulas and Tables.

(1.) From Williams's "Practical Geodesy."

Let h = difference of level of two stations; M and m the barometer-readings at lower and upper stations; T and T′ attached, t and t' detached thermometer at lower and upper stations; then,

$$h = 68{\cdot}965517\left[806 + t + t'\right]\left[\log \mathrm{M} + \log(9600 - \mathrm{T} + \mathrm{T}') - \log m - 3{\cdot}982271\right] \quad . \quad . \quad . \quad . \qquad (14)$$

Example—

Barometers.	Thermometers. Attached.	Thermometers. Detached.
M=29·98, . .	T=63° . .	t=62 lower station.
m=26·17, .	T′=47 .	t'=45 upper "

Substituting in (14),

$$\left.\begin{aligned} h &= 68{\cdot}965517\left[806+107\right]\left[\log 29{\cdot}98 + \log 9584 - \log 26{\cdot}17 - 3{\cdot}982271\right] \quad . \quad . \quad . \quad . \quad . \\ &= 68{\cdot}965517 \times 913 \times \left[1{\cdot}476832 + 3{\cdot}981547 - 1{\cdot}417804 - 3{\cdot}982271\right] \quad . \quad . \quad . \quad . \quad . \\ &= 68{\cdot}965517 \times 913 \times 0{\cdot}058304 = 3671{\cdot}1415 \quad . \end{aligned}\right\} (15)$$

(2.) From Belville's "Manual of the Mercurial and Aneroid Barometers."

Let h = difference of level of two stations; A the mean height of the barometers in inches; a their difference; b the number in the following table corresponding to the mean height of the thermometers; then,

$$h = \frac{30\,a\,b}{\mathrm{A}} \quad . \quad . \quad . \qquad (16)$$

(16) is the formula of Sir George Shuckburgh; it is empirical and gives results rather greater than those of (14); but the experiments of Sir George are regarded as being very exact.

For the Aneroid, Belville gives this formula:

As the sum of the readings : is to their difference : : 55000 : the difference of level.

Let h = difference of level of two stations; M and m the readings of the barometer at them; then,

$$h = 55000\ (\text{M}-m)\ (\text{M}+m)^{-1} \qquad . \qquad . \qquad (17)$$

The results of (17) correspond pretty well with those of (16.)

TABLE *of Sir George Shuckburgh giving the factors corresponding to the mean of the thermometers.*

Therm.	Factor.	Therm	Factor.	Therm.	Factor.	Therm.	Factor	Therm.	Factor	Ther.	Factor.
30°	864·4	39°	883·4	48°	902 3	57°	921·4	66°	940 3	75°	959·3
31	866·5	40	885·4	49	904 5	58	923·5	67	942·4	76	961·4
32	868·5	41	887 5	50	906·6	59	925·6	68	944·5	77	962 5
33	870·6	42	889·6	51	908·7	60	927·7	69	946·7	78	965·6
34	872·7	43	891 7	52	910·8	61	929·8	70	948·8	79	967·7
35	874·9	44	893·8	53	913·0	62	931·9	71	950 9	80	969·9
36	877·0	45	896·0	54	915·1	63	934·0	72	953·0	81	972·0
37	879·2	46	898·1	55	917·2	64	936·1	73	955·1	82	974·1
38	881·3	47	900·2	56	919·3	65	938·2	74	957·2	83	975·2

(3.) From Boye's Pneumatics.

Adopting the same notation as in (14), and representing by L the latitude of the place,

$$h = h' + h'' - h''' + h^{\text{iv}} \qquad . \qquad . \qquad . \qquad (18)$$

$$\left.\begin{aligned}
h' &= \Big[\log \big(\text{M}\,[1 + 0{\cdot}0001001\ (32^\circ - \text{T}) - 0{\cdot}0000104\ (62^\circ - \text{T})]\big) \\
&\quad - \log \big(m\,[1 + 0{\cdot}0001001\ (32^\circ - \text{T}') - 0{\cdot}0000104\ (62^\circ - \text{T}')]\big)\Big] \\
&\quad + 60158{\cdot}5; \\
h'' &= 0{\cdot}00111\ (t + t' - 64)\ h'; \\
h''' &= 0{\cdot}0028371\ \cos.\ (180^\circ - 2\,\text{L})\ (h' + h''); \\
h^{\text{iv}} &= \frac{h' + h'' - h''' + 52252}{20886861}\ (h' + h'' - h''');
\end{aligned}\right\} (19)$$

(18) is the most correct formula (theoretically,) of the four which have been given. It takes into consideration nearly all of the errors which can be corrected in the calculation. For extreme theoretical accuracy, M and m should also be corrected for *horary variation.*

In applying (18) care must be taken to give to h'', h''', and h^{iv}, their essential algebraic signs. h'' is usually positive and varies from ·03 to ·06 of h'.

The essential sign of h''' will depend upon the value of L. If L is less than 45°, cos. (180°—2 L) will be negative; and the term $-h'''$, will become $+h'''$. h^{iv} is always positive.

If the latitudes of the stations differ, L may be taken as their mean.

h''' and h^{iv} are usually so small that they may be omitted when only ordinary accuracy is necessary. Neglecting them, (18) becomes,

$$h = h' + h'' \qquad . \qquad . \qquad . \qquad (20)$$

The values of h' and h'' are obtained from equations (19).

The formula by which the results in the "Report" were obtained is not given. This is a grave oversight on the part of Lieutenant W., or his computation. The principal reason for instituting the comparison between the two instruments, was to determine their relative accuracy; and it is not sufficient to give merely the results of the computations; processes and formulas should be given in full. Different investigators have deduced different formulas, and these do not give the same results. In instituting a comparison between the two instruments, the particular formula used in the computations should be given, for any other will not, probably, give the same results.

For engineering purposes the formula should be as simple as possible.

Should this reach the eye of Lieutenant W., it is hoped that he will communicate the formula which he employed.

For more particular information with regard to the philosophy of the barometer, its construction, &c., the reader is referred to Boye's Pneumatics, Belville's Manual, Williams's Geodesy, and works on natural philosophy generally.

The following Tables are given as being not devoid of interest, in connexion with this paper, which treats of the relative accuracy of the level and barometer:

(*a*)

	S. Barom		A. Barom.		Hygrom Lev.		
Hr.	Barom.	Th.	Barom.	Th.	W. B.	D. B.	
7	28·942	61°	28·937	60°	56°	59½°	4·742
8	28·950	68½	28·962	65	59½	65½	4·736
9	28·964	73	29·000	69½	63	70	4 724
- -	- -	- -	- -	- -	- -	- -	4·741
10	28·970	76	29·025	74	66½	74	4·770
- -	- -	- -	- -	- -	- -	- -	4·734
11	28·950	78	29·025	77½	70	78	4·736
·12	28·952	83	29·025	81	71½	81½	4·725
- -	- -	- -	- -	- -	- -	- -	4·732
1	28·930	84	29·012	83½	73	83½	4·722
- -	- -	- -	- -	- -	- -	- -	4 734
2	28·912	86	29·006	85	74	86	4·711
- -	- -	- -	- -	- -	- -	- -	4·742
3	28·900	85½	29·000	86	74	85	4·684
- -	- -	- -	- -	- -	- -	- -	4 740
4	2~·900	85½	29·000	86	74½	85	4·715
- -	- -	- -	- -	- -	- -	- -	4 740
5	28·900	87½	28·981	85½	75½	84½	4 714
- -	- -	- -	- -	- -	- -	- -	4·836
6	28·9000	82	29·006	85	74	82	4·730
- -	- -	- -	- -	- -	- -	- -	4·735

(*b*)

	S. Barom.		A. Barom.		Hygrom Lev.		
Hr.	Barom.	Th.	Barom.	Th.	W B	D B.	
3⅔	29·100	82½°	29·250	84°	78°	84°	3·978
5	29·110	82	29·262	84	77½	84	4·041
- -	- -	- -	- -	- -	- -	- -	3·982
6	29·118	82	29·262	85	77	83½	4·000
- -	- -	- -	- -	- -	- -	- -	3·985
			(*c*)				
7¾	29·142	76	29·312	75½	- -	- -	4·180
9	29·200	76	29·312	76½	72½	75	4·184
10	29·200	79½	29·330	78	75	78½	4·167
- -	- -	- -	- -	- -	- -	- -	4·180
11	29·212	82	29·350	80½	76	81	4·192
- -	- -	- -	- -	- -	- -	- -	4·184
12	- -	- -	- -	- -	- -	- -	4 197
- -	- -	- -	- -	- -	- -	- -	4·184
			(*d*)				
3	29·134	87	29·305	86	78½	86	4·083
4	29·130	87	29·325	86	77	85½	4·000
- -	- -	- -	- -	- -	- -	- -	3·992
5	29·192	85½	29·250	85½	70	86	4·092

The observations in table (*a*) were made on the 30th May, 1857; all of the instruments, except the level and rod, were in doors; the rod was kept in the shade; the telescope of the level ranged about E. and W.

The observations upon the level were made without any anticipation of the results which followed. At 7 A. M., it was carefully leveled and clamped; after which the clamp and tangent screw were not touched until the observations for the day were over. The rod was 66 feet from the level. At 8 o'clock the bubble was observed to be displaced, but the instrument was leveled by means of the leveling

screws, before the reading was taken. Afterwards, two readings of the level were taken at the expiration of every hour; one before leveling, and one after. The numbers at the extremities of the dotted horizontal lines are the readings after leveling. There was a good deal of wind during the day from the south; clouds commenced to gather also, and during the next two days there was much rain.

These facts are mentioned as affecting the barometer-readings; they are not supposed to have influenced those of the level. Curiosity having been excited by the differences of the level-readings, opportunity was taken to verify them by other observations. Those recorded in (*b*) were made during the afternoon of August 7th, 1857. The telescope ranged about N. and S.; the rod was 66 feet south of the level.

On the following morning the observations recorded in (*c*) were made. The telescope ranged N. and S., and the rod was 66 feet south of the level.

During the afternoon of the same day, the observations in (*d*) were made. The telescope ranged E. and W., and the rod was 66 feet on the west.

In the notes giving the observations recorded in (*b*), (*c*), (*d*), nothing is said about the state of the weather, and the presumption is, that it was calm and fair: such also is the recollection of it.

(*e*)

Hr.	S. Barom.		A. Barom.		Hygrom.		Lev.
	Barom.	Th.	Barom.	Th.	W. B.	D. B.	
7	29·310	50°	- -	- -	-	-	- -
8	29·330	58	29·342	56°	-	-	4·988
9	29·344	63½	29·392	62	-	-	5·252
- -	- -	- -	- -	- -	-	-	4·902
10	29·354	66½	29·408	66	-	-	5·000
- -	- -	- -	- -	- -	-	-	4·982
11	29·350	70	29·425	69	-	-	4·983
- -	- -	- -	- -	- -	-	-	4·973
12	29·344	72	29·425	72½	-	-	4·973
- -	- -	- -	- -	- -	-	-	4·980

(*f*)

Hr.	S. Barom.		A. Barom.		Hygrom.		Lev.
	Barom.	Th.	Barom.	Th.	W. B.	D. B.	
1	29·336	74°	29·412	71°	-	-	5·020
2	29·322	75	29·412	75	-	-	5 002
- -	- -	- -	- -	- -	-	-	5·024
3	29·336	76	29·418	77	-	-	4·980
- -	- -	- -	- -	- -	-	-	5·030
4	29·336	82	29·462	84	-	-	4·940
- -	- -	- -	- -	- -	-	-	5·030
5	29·330	72½	29·425	75	-	-	5·030
- -	- -	- -	- -	- -	-	-	5·037
5½	29·328	71	29·412	73	-	-	5·037

Fair, but rather windy.

The observations recorded in (*e*) were made during the morning of 18th September, 1858; those in (*f*) during afternoon of same day.

The variations of the level-readings are attributed to unequal expansion and contraction of the parts of the instrument; but to whatever cause they may be due, it is evident that the bubble will not remain stationary for any great length of time, when the instrument is exposed to the sun.

It very frequently happens that much time elapses, after a back-sight has been taken, before the next fore-sight can be made; during this time the bubble will probably be displaced, and the question arises, should the level-man restore the bubble to the middle of the tube before making the next reading? The observations with regard to this source of error have not been sufficiently multiplied to warrant a decided reply to the question, but the general result thus far, seems to indicate that he should. This subject merits, and it is hoped that it will receive, the attention of engineers. Upon the accuracy of the

spirit-level depends the correctness of their calculations, with regard to many of the most important and costly operations in railroad engineering. The error due to this variation of the reading, whatever may be the cause of the displacement of the bubble, will increase as the distance of the rod from the level is increased. In the foregoing observations the rod was placed 66 feet from the level each time. Calling the error for 66 feet, a; the error for 100 will be, $1{\cdot}5\,a$; for 200, $3\,a$; for 300, $4{\cdot}5\,a$; and so on, in arithmetical progression.

It will be observed from the table, that when the telescope ranged E. and W., the bubble ascended to the west end of the tube in the morning, and the east end in the evening.

Care was taken to place the leveling rod in the same spot at each observation. It was supported upon a broad and hard bearing surface, to prevent it from settling in the ground.

Bowdon, Ga.

AMERICAN PATENTS.

List of American Patents which issued from September 7 to September 28, 1858, (inclusive,) with Exemplifications.

SEPTEMBER 7.

1. Revolving Fire Arm; Ethan Allen, Worcester, Massachusetts.

Claim—Constructing that part of the pin, c, that projects in front of the cylinder, so as to produce a projecting angle toward the junction of the barrel and chamber that is being discharged. Also, the guards, when constructed as described.

2. Harvesters; R. L. Allen, City of New York.

Claim—Elevating the cutting apparatus and balancing the machine in going over stones, stumps, and other obstructions, and traversing hill sides, by means of the long raker and drivers' seat, in combination with lever, P, as set forth. Also, constructing the spring axle of three several pieces, clamped and riveted in the manner set forth. Also, the position of said axle, F, the same being at right angles with the line of draft, and performing the office of spring and axle, and fastened by bolt, x. Also, the form of the socket piece for receiving the ends of the spring standard to support the rakers' and drivers' seat. Also, the construction of the double shoe and standard, adaptable to the cutting of grain or grass, the same being in three pieces, the pieces being put together in a particular way. Also, making the shoe under the mortise thick at edge, a, and thinner at a, in order to give greater thickness and strength to the finger board along a a.

3. Sewing Machines; B. Atwater, Berlin, Connecticut.

Claim—The arrangement of the guide plates with respect to one another, the needle, and the bed plate, viz: so that there may be a space between the bed plate and the upper end or notch of the guide plate, and the two guide plates be placed so close together as to hold the middle of the bow of the loop in position, and bridged across the recess of the plate, substantially in manner for the reception of the needle by the loop, and to effect advantages as set forth.

4. Harrows; David C. Ayres, Lumberland, New York.

Claim—The combination of tubular piece, globular projections, cutters, and teeth, constructed and arranged as described.

5. Corn Planters; A. G. Babcock, Galesburg, Illinois.

Claim—The arrangement and combination of the entire machine.

6. Coal or Ashes Sifters; Louis D. Bartlett, Boston, Massachusetts.

Claim—Using the annular ring and the cover, in combination with the sieve.

7. Joints for Railroad Tracks; E. U. Benedict, Horicon, Wisconsin.

Claim—The combination of the ends of the rail, with the peculiarly constructed wrought iron T-shaped joint plate, by means of the stirrup bolts which pass from the upper surface of the base of the rail through the said base, and through the lips of the plate, and around the lower edge or pan of said plate.

8. Water-Closet; George Blanchard, City of New York.

Claim—The arrangement of the swinging frame, the pedals, the bolt, the seat, the two bars, and the platform, substantially as described.

9. Hanging Bells; George R. Meneely, West Troy, New York.

Claim—Uniting a bell furnished with horns to a yoke, through the intervention of a cap and clevis bolts, so that said bell may be turned in its yoke, in the manner specified.

10. Operating Window Blinds; Theodore Christian, City of New York.

Claim—Coupling the slats together, as described, and connecting a whole panel by means of a rod, in the manner set forth, grooving the rod in a straight line. Also, taking the bearings of the tenons upon the inside of the channel therein, and beyond the pulley.

11. Cane Seat for Chairs; John R. Cannon, New Albany, Indiana.

Claim—The manufacture of chair bottoms, substantially in the manner specified.

12. Grates for Coal Stoves; James Easterly, Albany, New York.

Claim—The combination of the grate, the bar, and the clasp, or its equivalent.

13. Machine for Ruling Paper; J. C. Forman, Cleveland, Ohio.

Claim—The movable bed operated through the medium of the rack and grooved plate, in connexion with the gearing, or its equivalent. Also, the frisket attached to the bar, k, provided with the bar, q, and used in connexion with the bar, J, on the pen beam.

14. Printing and Numbering Press; George J. Hill, Buffalo, New York.

Claim—The combination of a numbering machine and pawl, or its equivalent, with a printing press, as set forth. Also, the adjustable plate, in combination with the numbering machine, as described.

15. Car Seats and Couches; R. E. Fowler, Clayton, New York.

Claim—1st, Having a shaft extended from one end of the seat to the other, when said shaft is furnished at one end with a crank, and at each end with a pinion or friction roller, and said pinion or friction rollers work in connexion with large spur wheels or large friction rollers, which have the arms of the back, d, or the arms of the foot boards pivoted eccentrically to them. 2d, Attaching the arms of the foot board to the lower spur wheel or friction rollers, by means of turning pivots and hinge joints, in combination with attaching the suspension rods of the foot boards by loose eyes to long staples or brackets, substantially as set forth.

16. Machines for Digging Potatoes; Nathaniel Gear, Zanesville, Ohio.

Claim—In combination with the scoop for digging, the skeleton wheel for gathering, carrying, sifting, and delivering the potatoes into the box or receiver, substantially as described.

17. Cutting Device for Harvesters; C. P. Gronberg, Montgomery, Illinois.

Claim—The semi-cylindrical finger bar, A, concave and perforated fingers, B, and the sickle formed of the bar, C, and teeth, D, when the above named parts are constructed substantially as set forth.

18. Fruit Box; Nicholas Hallock, Flushing, New York.

Claim—Constructing a fruit box consisting of two sheets of material, one of which forms the body of the box, the other the bottom, being ventilated as described, and combining therewith the folding handle.

19. Coffee Roasters; Theodore Heerman, Mitchelville, Tennessee.

Claim—The employment of two reversely inclined concentrating plates, which have a space existing between their approximating ends on the inner circumference of a revolving coffee-roasting cylinder.

20. Window Blinds; A. Herder, City of New York.

Claim—The wire cloth strips attached to the window blind, to form a combined blind and insect bar or net.

21. Machines for Moulding Clay; Thomas Hoadley, Cleveland, Ohio.

Claim—The rotating mould and rods or rammers, in connexion with the rammer elevating plate. Also, the guides, one or more attached to the shaft, and used in connexion with the elastic bands on the rammers.

22. Convertible Carriage Shafts; Amos K. Hoffmeier, Lancaster, Pennsylvania.

Claim—1st, The combination of the pole hook with its eyes and points, as they fit into the front ends of the shafts which form the pole. 2d, The arrangement and combination of the shafts operating on joints, that when closed together form the pole.

23. Meat Cutter; Jacob R. Hoyer, Reading, Pennsylvania.

Claim—The arrangement of the knives in pairs on the periphery of the revolving cylinder, with their edges radiating from the centre of the cylinder, so as to operate the same as shears in passing between the knives of the hollow cylinder.

24. Ploughs; Samuel Hulbert, Ogdensburgh, New York.

Claim—The adjustable beam, slot, pivot, spring clevis, and adjustable handle, combined as set forth.

25. Kneading Machine; Wm. S. Reinert, Philadelphia, Pennsylvania.

Claim—The shaft with its corrugated roller and pinions, in combination with the guides and pinions, when the whole of the above named parts are so constructed and arranged in respect to the trough, that they may have an upward or downward movement controlled by the weight, or its equivalent, independently of the trough.

26. Apparatus for Applying Soles to Boots and Shoes; Jacob Jenkins, Charlestown, Massachusetts.

Claim—The combination of the elastic bed and the sole adjusting cavity or space arranged in a press, and so as to operate together as specified. Also, constructing such sole adjusting cavity with adjustable sides or adjustable ends, or both its sides and ends made adjustable. Also, the combination of the lever clamps with the adjusting cavity and the elastic bed, and so as to operate therewith. Also, the combination and arrangement of the tank with the elastic bed and the sole adjusting cavity.

27. Escapement of Time-keepers; Joseph Jennet, Meadville, Pennsylvania.

Claim—The first balance wheel constructed with cogs on its periphery, gearing into the pinion, and the second balance wheel moved thereby, in the manner described.

28. Iron Safe; Lewis Lillie, Troy, New York.

Claim—The mode of forming the corners of a safe with anchors, also the jamb, as set forth.

29. Railroad Indicator; Gardner R. Lillibridge, Wayne Co., Michigan.

Claim—The trap or obscurer, in combination with my peculiar method of exhibiting the number of miles between stations. Also, a movable cradle which contains and confines the cylinder's scroll and friction rollers, in combination with the screw for regulating the tension of the scroll.

30. Cultivators; Israel Long, Terre Haute, Indiana.

Claim—The employment of two frames which are furnished with harrowed teeth at their forward end,

and cultivator teeth at their rear ends, and connected by arch braces, in combination with the propelling wheels arranged on short crank axles, the tongue, arranged on top of the arch braces, and with the adjusting arrangements.

31. Machine for Printing Addresses on Newspapers, &c.; James Lord, Pawtucket, Massachusetts.

Claim—1st, Imprinting the names and addresses of subscribers and others, on newspapers, envelopes, &c., by inserting type expressing such name and address in boxes secured spirally on the periphery of a revolving cylinder, and causing the said newspapers or envelopes to be successively pressed against the type in the boxes by means of a platen or follower which is made to act in concert with the cylinder. 2d, The combination and arrangement of the connecting rod, vibrating lever, pawl, ratchet, and screw shaft, for giving the required revolving motion to the printing cylinder, and longitudinal motion to the platen, and receiving, conducting, and distributing rollers. 3d, The combination and arrangement of the eccentric cams, longitudinal shaft, and upright rod for raising the platen or follower to produce the required impression upon the paper. 4th, The combination and arrangement of the cima reversa formed slots in the ears and ends of the branch rods of the curved bars, with the distributing and conducting ink rollers. 5th, The combination of the adjustable plate, oscillating bar and plate, between which it is secured, and graduating thumb screws, with the ink receiving roller.

32. Apparatus for Preparing Elliptical Frames for Gilding; Robert J. Marcher, City of New York.

Claim—Providing the bar with a foot or support and sliding plate or tool, when the bar is arranged relatively with its upright grooved or slotted bar, and the frame.

33. Hoisting and Dumping Apparatus; George Martz, Pottsville, Pennsylvania.

Claim—The combination of the car, hung and controlled in its up and down movements in the peculiar manner specified, with a sliding gate and stationary frame, which are constructed and arranged in the peculiar manner specified.

[This invention consists in a car closed in at top and back, pivoted to a sliding gate, and governed in such a manner that its tail-board lies horizontal while the car is being loaded, and its bottom horizontal while the car is being dumped, said car and sliding frame being arranged within a stationary frame, which is furnished with suitable guides for governing its movements and allowing the car to dump, and with a suitable shute, which compels it to tilt and dump a load, and which also holds it in such a condition that while being lowered its bottom is compelled to stand vertical, and its back lie horizontal when down, and being loaded.]

34. Butter Worker; Ziba Williams, Ithaca, New York.

Claim—The combination of a trough and a ladle having parallelism to the axes thereof, for the purpose of working butter, when the same are constructed and arranged in the manner described.

35. Paddle Wheel Propellers; John May, Columbus, Georgia.

Claim—The arrangement of the buckets or floats with the guides, with the centre and the frame, arranged in the manner described.

36. Governor Valve for Steam Engines; Stuart B. McCray, Grand Rapids, Michigan.

Claim—1st, Having a hollow cylindrical valve constructed and arranged to work in suspension over a vertical piston, so that it does not come in contact with any horizontal surface, nor has any point of binding contact against said vertical piston. 2d, The suspending and working of a hollow cylindrical valve, by means of an eccentric or other analogous device, which said eccentric is so arranged on the shaft of the slotted rocking link that its longest radius is at right angles, or nearly so, with the valve stem, when the valve is closed, and its shortest radius parallel, or nearly so, with the link of the governor.

37. Binding Attachment to Reaping Machines; James Mitchell, Osceola, Iowa.

Claim—1st, The combination of the jaws, arranged as shown, and attached respectively to the slider and springs, whereby they are made to receive and grasp the ends of the band. 2d, The clamp constructed of two parts attached to the rotating wheel, and used in connexion with the slide bar and ledge, for the purpose of twisting the ends of the band. 3d, The jaws, clamp, band twisting device, tucking rod, and discharge rod, combined and arranged to operate as set forth.

38. Couches for Railroad Cars; F. R. Myers and F. H. Furniss, Cleveland, Ohio.

Claim—The couch with the rods and the collars or the adjustable collars and springs, as an arrangement of means for providing such number of couches as, in connexion with such as may be made of the car seats, will accommodate a complement of passengers.

39. Calipers and Dividers; Joseph D. Moon, Chelsea, Massachusetts.

Claim—Having the parts of the legs made of circular form, geared or toothed, and the screw placed between them and gearing therein, the above parts being fitted within the socket, and the screw provided with nuts.

40. Raking Attachment to Harvesters; John Nelson, Rockford, Illinois.

Claim—The arrangement of the arm and rake connected by an articulating joint, the spring and cord, in combination with the guide.

41. Scythe Blades; Samuel D. Nelson, Pittsburgh, Pennsylvania.

Claim—Constructing grass and cradle scythes by starting the web of the scythe from one edge of the back, making the back concave on the upper and convexed on the lower side, leaving the heaviest and thickest part of back on the centre, and to the outside of the convexed side of the back, thereby making the scythe stiffer and stronger.

42. Harrows; Samuel J. Orange and George Bridelman, Grayville, Illinois.

Claim—The combination of the handles, or their equivalent, with the transverse beams and rollers, and the circular frame, by which we are enabled, by regulating the pressure on the handles, to guide the harrow in the line of the draft or deflect it at pleasure.

43. Seed Planters; Benjamin Owen, Dayton, Ohio.

Claim—Operating the arms and hoe by means of the disks provided with teeth or spurs, and arranged as set forth.

44. Operating Valve of Steam Engines; H. Uhey and H. A. Luttgens, Paterson, New Jersey.

Claim—The cam, or equivalent, in combination with the valve gear, adapted to operate a single slide valve.

45. Portable Copying Apparatus; Wm. Van Anden, Poughkeepsie, New York.

Claim—The improved method of uniting a cylindrical removable back or holder with a copying back, by means of a concave or tubular channel cut longitudinally with the face of the cylindrical back or holder.

46. MACHINE FOR TURNING HUBS; Alexander Rickart, Schoharie, New York.

Claim—Rotating the mandrel of the carriage from the cutter shaft through the medium of the worm wheel and screw gearing, as described—it being understood that I do not claim, broadly and in the abstract, the well known mechanical device of a worm wheel and screw gearing—but the parts above named, when arranged with the cutter shaft and mandrel of the carriage, so that the mandrel will be connected with the shaft, and disconnected therefrom at the proper time, by the movement of the carriage.

47. BILLIARD BALLS; Calvin B., John, and Wm. C. Rogers, Deep River, Connecticut.

We do not claim simply the cementing of a series of pieces of ivory together, and turning the same to form a billiard ball, irrespective of the disposition and arrangement of said pieces in respect to each other, as described, for various articles are formed in sections or of a series of pieces joined together, and turned or otherwise formed into proper shape.

Claim—Constructing billiard balls of a series of pieces, three or more cemented, or otherwise secured together, when said pieces are disposed or arranged in relation to each other in respect to their fibre or grain.

48. COAL STOVES; Silas T. Savage, Albany, New York.

Claim—The combination of the magazine, radiators, and the air chamber at the base of the radiators, as arranged in reference to and with each other, substantially as set forth.

49. COAL STOVES; Silas T. Savage, Albany, New York.

Claim—The combination of an open cylindrical or basket grate, with a dome or a cone shaped cover placed within an outer chamber, having a register for the admission and regulation of a current of air between the grate and the walls of said chamber, arranged near the bottom of the chambers, substantially as the same is described.

50. CONSTRUCTION OF COAL STOVE LINING; Silas T. Savage, Albany, New York.

Claim—The employment of metallic framing to contain fire-clay or other lining for coal stoves, for the purpose of preserving it from injury by adhesion of clinkers.

51. LOOMS; E. M. Scott, Auburn, New York.

Claim—1st, Operating the shuttle motion by means of the lay, in the manner described. 2d, The combination of the sliding shaft attached to the lay, the rollers, or their equivalents, on said shaft, the cam and its appendages attached to the lay for giving longitudinal motion to the shaft, and the dog attached to the breast beam to operate the cam, the whole applied and operating substantially as described, to actuate the shuttle motion at one side of the loom only at a time by the movement of the lay. 3d, Operating the harness motion by means of the lay, in the manner specified. 4th, The combination of the swinging frame and its dogs, cams, and turning plate, with the lifting rods below the headle frames, the dog and the lay, to cause the headles to be operated alternately or in proper order of succession.

52. HOSE CARRIAGE; I. S. Schuyler and L. A. Rockwell, City of New York.

Claim—1st, The arrangement and combination of two separate and independent rope reels, respectively and separately with the bearing wheels rotating on the axletree to which the reels are secured. 2d, The described method of connecting and disconnecting the rope reels, with the bearing wheels of a fire engine, hose cart, or other fire apparatus, for the purpose of taking in the drag rope while the apparatus is drawn by it.

53. MACHINE FOR IRONING CLOTHES; John Shaefer, Lancaster, Pennsylvania.

Claim—The combination and arrangement of the hollow cylinder, with the rollers, the screws and caps, the spigot, the screw plug, the screw, the tables, all secured in the frame, and operated by the crank and gear wheels.

54. CARPET SWEEPER; Reuben Shaler, Madison, Connecticut.

Claim—1st, The combination in a machine for sweeping carpets, of a brush, the bristles of which are set at an angle of about forty-five degrees from a radial line passing directly outward from the axis constructed with a traction roller. 2d, The construction of a traction roller of a sweeping machine, by winding a spiral flanch of india rubber, or other flexible and adhesive substance, around a cylinder, by which a very powerful adhesive traction of said roller is insured, and the roller is much more cheaply manufactured.

55. SEEDING MACHINES; Samuel Stanbro, Salem, Michigan.

Claim—The application of a twisted cord, in combination with measuring tubes, arranged for the purpose of measuring and delivering seed.

56. METHOD OF MANUFACTURING SHINGLES FROM THE LOG; C. L. Story, Owensboro', Kentucky.

Claim—The circular saw, rotary and laterally moving cutters, the rotary cutters, and traveling carriage, arranged and combined, whereby the shingles are cut from the bolt, tapered and jointed at one operation. Also, the particular means for rotating the bolt at each termination of the movement of carriage, and thereby setting the bolt to the saw, to wit: the screw worm wheel, actuated through the medium of the arm, rod, bar, rod, and guide ledge.

57. TRAP FOR ANIMALS; R. M. Turner, Woodland, Michigan.

Claim—The tilting platform and treadle connected with the spring catch, the platform being placed within the base, and the platform and treadle arranged in relation with the box and bait chamber.

58. ALARM LOCKS; J. W. Wells, Pittsburgh, Pennsylvania.

Claim—The use and combination of a bell catch in the keeper of a lock, and a spring catch in the locking bolt, so arranged as to set the alarm by simply locking the door, and to spring the alarm and ring a bell whenever the door is unlocked.

59. BRICK MACHINES; Henry White, Cleveland, Ohio.

Claim—1st, The beveled joints of the mould, as arranged. 2d, The mechanism, when relatively arranged in its several parts as set forth.

60. METHOD OF ALLOWING FOR EXPANSION AND CONTRACTION OF FENCES; Olly Williams, St. Louis, Missouri.

Claim—The combination of the shaft with the post, and the application of the wires to the said shaft, whereby all the wires are tightened at one and the same time by one and the same weight.

61. SEWING MACHINES; J. B. Woodruff, Washington City, D. C.

Claim—1st. The double corrugated yielding spring between which the thread is guided, the same being regulated by a thumb-screw, or any equivalent device, to bear upon the thread in the manner described, to produce any degree of tension required. 2d, Making the bowl or shuttle carrier, and attaching it to the slotted driver, in combination with the circular shuttle race. 3d, The application of extension rods for pitmans

to sewing machines, when used in combination with a hinged foot-piece to be placed upon the floor, and the machine upon a table.

62. Life-Boat Constructed of Mattresses; Jabez M. Woodward, City of New York.

Claim—1st, Constructing the mattresses with the strong canvass or duck attached to them with the eyelet holes, so that they can be united at their edges by lashing for the purpose of making a boat or life raft. 2d, The manner of constructing the berth bottoms or supports into frames in the shape of, or similar to, right angled triangles, in combination with the mattresses. 3d, The combination of the mattresses, canvass, and eyelets, with the lashings, diaphragm frames, and spar, arranged into the form of a boat or life raft.

63. Stamping Milk Cans; Wm. Mt. Storm, Assignor to Allan Cummings, City of New York.

Claim—The press with the counterpart die-bearers, forming segments of two concentric circles to fit the exterior and interior of the "breast" of a narrow mouthed can, and having the movable S-shaped head block carrying the follower by guide rods, as shown, on the one part of a die-bearer, while the counterpart die-bearer is provided with rods with hands that pass through holes provided in the can to catch upon the head block, the whole being so constructed that two parts of the press may be combined and operated through the thickness of the can to perform its office, and thereafter be readily separated and removed, the purpose being to facilitate the marking of such cans after construction is completed.

64. Sewing Machines; M. L. Clinton, Assignor to H. F. Hibbard, Ithaca, New York.

Claim—The cams on shaft, in combination with spring hook, constructed and operated in the manner described.

65. Bullet Machine; C. Young, Auburn, New York.

Claim—1st, The application of elastic rolls, for the purpose of feeding lead wire into the machine. 2d, The application of the arrangement or device for gauging, cutting, and depositing the lead into the dies by the same instrument, and the manner of constructing and operating this portion of the machine. 3d, The application of the arrangement or device of lateral punches for removing the bullet from the dies.

66. Manufacture of Brushes; Stephen Barnes, Assignor to self, Henry S. Parsons, and Samuel Rowland, New Haven, Connecticut.

Claim—The securing of the bristles in separate tufts, in the manner described, by the employment of the tubular block, or its equivalent.

67. Sewing Machines; S. C. Blodgett, Assignor to G. B. Sloat & Co., Philadelphia, Pennsylvania.

Claim—My improved mode of operating the hook about the bobbin, viz: with a compound motion produced by a crank and an arm or by two cranks, whereby the point of the hook is made to travel either in an elliptical or circular path, without being reversed or made to point upward and downward during its rotation. Also, the particular mode of constructing the hook, viz: so that not only the heel part thereof shall lap over the edge of the bobbin, but the point of the said hook extend obliquely, in manner as described, or toward the needle, and so as to operate therewith as explained, and making the said hook with an auxiliary hook or notch, the same being to operate together as specified.

68. Flues of Elevated Oven Cooking Stoves; James Easterly, Assignor to self and D. G. Littlefield, Albany, New York.

Claim—Combining with flues, D D, and a centre passage, arranged substantially as described within the stove, an elevated oven having its flue space, on its sides and top an open chamber, in connexion with a descending flue with its exit at the base.

69. Steam Pressure and Water Indicator; William C. Grimes, Assignor to David Matthew, Philadelphia, Pennsylvania.

Claim—Constructing and arranging the concentric glass tubes with the connecting pipes. Also, the manner of constructing and arranging the connecting pipes with the boiler and the branch or equilibrium pipe between the concentric connecting pipes at the water line of the boiler.

70. Couch Seats for Railroad Cars; John Hartman, Jr., Assignor to John Hartman, Sr., Philadelphia, Pa.

Claim—The combination and arrangement of devices whereby the seat proper can, at the pleasure of the operator, be arranged and securely maintained either in the horizontal position of a chair seat, or in the same plane with the inclined position of the foot-rest frame as a couch, the same consisting of a pedestal, seat, stem, brace, and foot-rest frame, or their equivalents, combined so as to operate substantially in the manner described.

71. Diaphragm for Photographic Cameras; C. C. Harrison and J. Schnitzer, Assignors to C. C. Harrison, City of New York.

Claim—The adjustable diaphragm or stop, composed of overlapping plates operated concentrically by the ring, or its equivalent, said ring being operated from the outside of the tube by means of the lever or arm, or other appropriate device, as described.

72. Railroad Chairs; Adam Hay, Assignor to self, S. W. and L. B. Miller, Newark, New Jersey.

Claim—1st, The lip or projection, formed as represented, to support the flanch of the rail, and in turn to be supported by the upper portion of the wedge. 2d, A chair having an aperture for the wedge which will in itself contain and secure the wedge, and yet leave it free to support the flanch perpendicularly, and to bind the rail laterally. 3d, The combination of the lip with the flanch of the rail and the wedge, in other words, I claim the support of the flanch by the lip, and the supports of the lip by the wedge, affording a firm rest for the flanch, at the same time preventing by this combination of wood and iron all vibration and jar. 4th, The combination on the chair of the wooden plug and the screw, in the manner described.

73. Steam Trap; J. W. Hoard, Assignor to self and G. B. Wiggin, Providence, Rhode Island.

Claim—The combination with the outer case or chamber of the valve, lever, diaphragm, mercury holder, and openings, constructed and operating as described.

74. Journal Boxes; H. H. Thayer, Sandwich, Assignor to J. A. Woodbury and S. A. Woods, Boston, Mass.

Claim—The combination of two, or any other suitable number of lubricating chambers and bearing surfaces, with one trough or channel arranged below them, as specified. Also, the combination of the intercepting chamber at each end of the box, with the oil trough, the lubricator chambers, and the bearing surfaces. Also, making the opening of the chamber of greater diameter than the journal, in manner specified. Also, in combination with the intercepting chamber, the intercepting groove, arranged in the cap in the manner specified.

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75. WASHING MACHINES; John Allen, Galena, Maryland.

Claim—So dressing with zigzag ribs the bottom of the tub and under surface of the rubbing disk, that the approximating angles of the ribs of the disk and tub shall form rhomboidal figures, wherein the clothes are subjected to an angular squeezing and oblique rubbing action, and the approximating knuckle or wedge shaped ends of said angles shall, when the motion of the disk is reversed, after the rhomboidal spaces and pummel and loosen up the clothes, so as to allow a fresh supply of cleansing water to circulate through them, and thus prepare them for a succeeding angular squeezing and oblique rubbing action.

76. WASHING MACHINE; Wm. T. Armstrong, Sandwich, Illinois.

Claim—The combination of the rubber and the slide with the stationary shaft.

77. REVOLVING FIRE ARM; Fordyce Beals, New Haven, Connecticut.

Claim—Constructing, applying, and arranging the centre pin and the rammer lever, so that the former is locked in place by the latter, when the latter is close to the barrel, and that the former is permitted to be withdrawn by bringing the latter to a position in which the rammer will not interfere with the cylinder.

78 LADIES' HOOP SKIRTS; Samuel Beberdy, Philadelphia, Pennsylvania.

Claim—The combination of a spiral stay with the fabric which constitutes a lady's skirt, when said stay is formed by winding a flexible strip or rod made of one piece or a series of pieces spliced or united together, continuously round the skirt from the bottom to the top of the body of the same.

79. JOINTS FOR T-RAILS; E. U. Benedict, Horicon, Wisconsin.

Claim—The combination of the rails with the side plates by means of the slots in the plates, the recesses in the bases of the rails, the gibs, and the keys. Also, forming the gib applied at the juncture of the rail, with the downward rectangular projection to serve as a stay between the plates.

80. MANUFACTURE OF SKIRTING MATERIAL; Ernest Bredt, City of New York.

Claim—The looped fabric described, having loops formed in it at intervals by combining the loop-forming material with the web in the process of weaving.

81. ENDLESS SECTIONAL SAWING MACHINE; Harvey Brown, City of New York.

Claim—1st, The form and manner of constructing the section of my saw. 2d, The mode of inserting the teeth in the saw, in the manner set forth. 3d, The guide plate, constructed and arranged as described, when used in connexion with the saw.

82. SAW FILER; A. H. Burdine, Chulahoma, Mississippi.

Claim—1st, A file constructed spirally on a revolving axis, so that a space exists between the two ends of the spiral or screw thread constituting the file. 2d, The combination of one or two of the above specified files with two conical rotating files, in a machine of the character specified.

83. PRINTING PRESSES; J. A. Campbell, New Orleans, Louisiana.

Claim—The teeth placed on a portion of the perimeter of the roller, for the purpose of pushing the card through the opening above the perpendicular grooves by the operation of these teeth on the surface presented by the front card of the pack, in combination with the rollers. Also, the adjustable plates, as specified, for the purpose of regulating the opening through which the cards have to pass to the thickness of the card. Also, the combination of the stationary arm, ball and socket, rod, short arm, and the working joint, for the purpose of giving the inking cylinder a lateral motion.

84. LANTERN ATTACHMENT TO CAPS; J. C. Cary, City of New York.

Claim—The lantern, constructed as shown, to wit: the fountain and lamp connected by the tube, and enclosed within the case, which is provided with the handle, bail, and straps, for the purpose of being attached to the cap.

85. RAILROAD CAR COUPLING; J. W. Corey, Crawfordsville, Indiana.

Claim—The arrangement and combination of the hinged coupling hook, slotted connecting link, and double inclined plane.

86. MOULDS FOR MAKING WARP DRESSER GUIDES OF GLASS OR OTHER PLASTIC ANTI-CORROSIVE MATERIAL; Alfred B. Corey, Franklin, Connecticut.

Claim—My improved mould as made with plunger cavities of the kind described in its bed plate, a body or body and flanch matrix, a removable plunger guide, or its equivalent, and a plunger provided with a series of projections or cores.

87. WARP DRESSING GUIDES; A. B. Corey, Franklin Connecticut.

Claim—A new or improved manufacture of warp dresser guides made of glass, or its equivalent, and by moulding it on smooth cores, and subsequently reducing the plate or the bars or projections made by the cores. Also, making a warp dresser guide in several separate sections, combined and applied in one frame.

88. STEAM HAMMER; Patrick Danvers, City of New York.

Claim—The combination with the reciprocating cylinder or ram, which constitutes or has attached to it the hammer block and the stationary piston, 5, of the piston, 4, and the external steam cylinder, provided with a proper system of valves.

89. SHINGLE MACHINE; Augustus Day, Detroit, Michigan.

Claim—1st, The butting or squaring knife, operated by the curved arms, and used in connexion with the stationary knife and adjusting clamps. 2d, The combination of the riving knife, jointing cutters, planers, and butting or squaring knives.

90. MOULD PLOUGH; Adam Defenbaugh, Walnut Run, Ohio.

Claim—So hanging the beam, wheels, and underground plough to each other as that the conductor of the machine may, at any time, without seeing the plough, raise and lower it so that the ditch shall have a regular descent regardless of the undulations of the ground underneath which it is formed, and over which the plough passes. Also, in combination with the underground plough, the scoring wheel, for forming a secondary trench in the bottom of the ditch, for the purpose set forth, and the friction rollers for relieving it.

91. TELEGRAPH INSULATORS; M. G. Farmer, Salem, and J. M. Batchelder, Cambridge, Massachusetts.

Claim—The iron wire supporter or hook, in combination with a screw insulator made of hard india rubber, and attached to the hook or shank.

92. Combination of a Governor with a Slide Valve; Richard Gornall, Baltimore, Maryland.

I do not limit myself to any particular character of taper steam ports. as various forms of taper ports might be made to answer the end in view, nor do I limit the use of my invention to flat surfaced slide valves, as it can be applied in connexion with a cylinder valve or a valve forming part of a circle with equal advantage.

Claim—1st, The combination in the manner specified, of the governor with a slide valve, which is constructed and operating as specified. 2d, Giving the crank pin by which the rock shaft is operated, a flaring or V-shape, in combination with the oblique or bevel ends of the slide valve and the enlarged slot of the connecting rod.

93. Rotary Steam Engine; John and Ezra Harthan, Timbersbrook, England; patented in England, January 26, 1858.

Claim—1st, The system or mode of obtaining motive power by causing steam or air to impinge upon a series of chambers with curved bottoms arranged around a wheel at or near the periphery thereof. 2d, The general construction and arrangements of machinery or apparatus for obtaining motive power.

94. Machine for Cutting Dovetails; T. E., A., and E. King, Cherry Valley, Ohio.

Claim—The parts shown in figs. 4, 5, 7, and 8, arranged and operating as described, for the purpose of cutting the mortises or gains in the drawer fronts. Also, the instruments shown in figs. 9 and 10, arranged and operating as specified, for the purpose of cutting the end pieces of drawers.

95. Horse Powers; G. Hely, Rochester, Wisconsin.

Claim—The combination of the sliding levers and the loose coupling bar with the draft chains.

96. Gate Hinge; T. Hendrick, Clyde, New York.

Claim—The employment of an angle plate having an oblong slot cut vertically through its horizontal angle, in combination with a plate which has the pintle or axial pin of the hinge on its lower edge, and a shifting projection on each of its side edges.

97. Gas Burners; L. E. Hicks, City of New York.

Claim—The construction of gas burners which have caps made with a crown concave internally applied to them, making the outer surface of the crown of the cap flat, or nearly flat, and the orifice through which the gas escapes of circular form horizontally and with its edge curved in the path of two vertical circles.

98. Building Walls under Water; Wm. H. Horstmann, City of New York.

Claim—1st, The sack or compartment formed by cloth, or some equivalent thereof, to produce slack water in a current or other movable water, and protect the current from being washed away and wasted before it is hardened. 2d, In combination with a flexible inclosure, the panels, as above specified, and supporting the same by spiles, in the manner set forth. 3d, The cement feeder, constructed and arranged substantially as specified.

99. Cutting Apparatus for Harvesters; Charles Howell, Cleveland, Ohio.

Claim—1st, A finger formed with a frog-shaped concavity on the under side of the knife, having outlets on its sides in front of the finger bar, in the manner set forth. 2d, A sickle or knife having a series of curved openings, or their equivalents, formed on its rear and under side, when used in connexion with guard fingers provided with a D-shaped rest, or its equivalent.

100. Heating Apparatus for the Manufacture of Cemented Sole Shoes; Jacob Jenkins, Charlestown, Massachusetts.

Claim—An improved heating apparatus for the manufacture of cemented sole shoes, consisting of the box provided with door, glass front, deflector, as described, openings, and lamp, or its equivalent, for heating.

101. Churn; Daniel Johnson, City of New York.

Claim—The employment of two or more rollers when placed horizontal and with their peripheries touching or nearly touching one another, in combination with a revolving dasher, which is arranged underneath said rollers, and in the same box or chamber with the same.

102. Railroad Car Couplings; C. P. Kenyon, Wilson, North Carolina.

Claim—The combination of the grooves, supporting ridges, lateral grooves, pusher. and blocks, arranged as described. Also, adjusting the coupling to suit cars with platforms of different heights, by means of the slide and a bolt passing through the holes, arranged as described.

103. Door Lock; Jacob Kinzer, Pittsburgh, Pennsylvania.

Claim—The use of a plate on the inside of a lock, which, by the insertion of the key, is moved to the other side of the lock and closes the opposite key-hole. Also, the use of said plate upon which to raise or form circles or segments, wards or pins, or their equivalents, which correspond to the formation or changes of the key, thereby facilitating and cheapening the manufacture of the lock.

104. Bullet Machine; J. A. Knight, St. Louis, Missouri.

Claim—1st, Arranging the movable mould bars, so that in opening the moulds they move not only away from the stationary mould bar, but to some extent in a direction transverse to the said stationary bars, as set forth, to produce the dragging action described, for the purpose of loosening the bullets from both parts of the moulds. 2d, Arranging the said swinging mould bars between centre screws, applied in such a manner as to provide for their adjustment longitudinally to obtain a perfect registration of the two halves of the several moulds.

105. Machines for Working Clay; Henry Leguay, St. Louis, Missouri.

Claim—My invention in mills or grinding gears for grinding clay or other substances, making openings and valves, substantially as described, in the spaces between the teeth in one or both gears to receive and hold the clay or substance ground. Also, in combination with the grinding gears, the moulding tube, when these parts are constructed and arranged for joint operation.

106. Machine for Notching and Trimming Hoops; Sanford Littlefield, West Troy, New York.

Claim—The relative arrangement of the cutters moving in ways rectilinearly and obliquely, whereby the notch is cut and trimmed in one operation.

107. Cutting and Finishing the Locks of Wooden Hoops; Hiram Littlejohn, Troy, New York.

Claim—The two separate knives, A B, when arranged together with a suitable bed, C, for use in cutting the locks of wooden hoops. Also, the knife, D, when arranged in combination with the knives, A B, or their

substitute, and the bed, C, for "barking" the lock while the hoop remains in the same place on the bed that it occupies during the cutting of the lock. Also, the knife, E, when arranged in combination with the knives, A B, or their substitute, and the bed, C, for trimming the lock while the hoop is in the same place that it occupied during the cutting of the lock.

108. Coating Electrotype Moulds; Henry Lovejoy and Robert Wheeler, Brooklyn, New York.

Claim—1st, Suspending the brush bar by the crank at one end, and attaching it to, and operating it by, the crank of the crank shaft, at the other end. 2d, The combination of the brush and bed with the blower and wind chest.

109. Valve Cock; J. C. Macdonald, Cincinnati, Ohio.

Claim—The collar on the valve stem, the guide cap, spring, head, connected with the stem by the handle and screw cap, combined as set forth.

110. Bedstead Fastening; I. M. May, Anderson, Indiana.

Claim—The combination of the plates secured respectively to the post and rails, and provided with the oblique slots and pins.

111. Tenoning Machine; John McCreary, Delaware, Ohio.

Claim—The construction and arrangement of the bit-holders, as set forth. Also, the manner of applying the set screw, as described.

112. Hemp Breaks; H. D. McGeorge, Morgantown, Virginia.

Claim—Breaking and cleaning hemp, flax, &c., by a combination of vibrating blades and stationary blades, and clearing devices acting in concert with them.

113. Meat Cutter; M. Newman, Oak Hill, New York.

Claim—In combination with the cutters the two branched rack or comb for holding the material against the cutter. Also, holding the rack or comb in its recess by the clamping of the two parts of the shell together. Also, the manner of holding and arranging the screw feeder on the shaft, so that a portion of the section of the screw shall be on said shaft.

114. Temples for Looms; R. Pilson, Laurel, Maryland.

Claim—The construction of temples for looms, wherein is employed an adjustable extension compound connecting bar or rod composed of the spindle bars or sections, and the splice lengths, the detachable independent tubular sheaths, the sliding yielding brackets or bearings, spring holders and springs, and whereby a double yielding action of the temples is brought about.

115. Harvesters; Isaac Reamer and Henry Miller, Conrad's Store, Virginia.

Claim—1st, Arranging the knife on springs and with its cutting edge slightly elevated above its rear edges. 2d, The employment of an auxiliary adjustable reel, in combination with the main reel.

116. Clasps for Cotton Bale Hoops; A. C. Richard, Newtown, Connecticut.

Claim—The use of the three rings, in combination with the hoop, as a cheap and convenient cotton bale hoop.

117. Cooking Stoves; Apollos Richmond, Brooklyn, Connecticut.

Claim—Extending the oven forward in a curved form and arranging around it the boiler holes, as set forth, in combination with the curved fire chamber.

118. Bed Bottom; F. Russell, Otselic, New York.

Claim—The combination and arrangement of the rods with the wires, 5, the bolts in the rails, substantially as specified.

119. Spring Balances in Combination with a Knife; George H. Smith, Glenwood, Iowa.

Claim—A knife having a spring balance inserted in its handle, as set forth.

120. Lanterns; Stillman C. Spaulding, Rutland, Vermont.

Claim—1st, Constructing a lantern by folding the edges of the several parts over wire frames, so that it can be compressed and packed in a small space on removing the glass sides, and in the way set forth, and so that solder is not needed to secure the pieces composing the top and bottom. 2d, The use of a coiled wire in the manner mentioned, to retain the glass sides in their place. 3d. Attaching the lamp of a lantern to a hinged bottom, and connecting the latter to a spring in the top so as to keep the lamp securely in its place when in ordinary use, yet admit of ready access to it, as described.

121. Corn Huskers; N. T. Spear, Boston, Massachusetts.

Claim—The combination and arrangement of the toothed beveled wheel, provided with one or more faces, with the smooth conical rollers, one or more, and boards, when these several parts are united together and arranged for joint operation.

122. Breech-loading Fire Arm; E. T. Starr, City of New York.

Claim—Opening and closing the rear end of the barrel to insert and inclose the charge, by a plate turning on an axis below and in the plane of the rear face of the barrel, when this is connected and combined with a wedge, or its equivalent, operated by a lever below, so that in the act of drawing out the wedge to liberate the breech plate the rear end of the barrel shall be opened to receive a charge, and by the act of lifting or forcing up the wedge the charge shall be inclosed and the breech-piece secured, while at the same time all the injurious effects of expansion and contraction and of fouling are avoided.

123. Combination Steam Valve; Robert Stewart, Elmira, New York.

Claim—The valve with the heads as guides or bearings fitting in chamber, in combination with the outer chambers and steam head against which valve, e, is pressed up, forming a steam joint operating as a self-adjusting valve, operating as described.

124. Making Pliers; Chester W. Sykes, City of New York.

Claim—Connecting the jaws of the pliers or pincers to the portions of the handles above and below the centre pin or fulcrum, upon which they move by pins at points diagonal with each other, and at equal distances therefrom, the lower set of the said pins being inserted and allowed to traverse (with the opening and closing of the handles and jaws,) in longitudinal slots in the lower parts of the said jaws.

125. Gate; William Tobey, Naples, New York.

Claim—Opening and closing the gate by the use of the parallel pivoted levers, when arranged in the manner set forth.

126. Bedstead; William S. Todd, Mechanicsville, Iowa.

Claim—1st, Attaching the ends of the side rails of the bedstead to the foot and head posts by the butt hinges, arranged in reverse positions with each other so as to enable the said side rails and the head and foot rails to be folded together almost parallel with each other. 2d, The combination of the right-angled brace or rod, groove in which it traverses, and turning winged or cam shafts, for disengaging the right-angled end of the said rod from the openings in the projections on the inner sides of the side rails.

127. Printing Press; Ervin B. Tripp, City of New York.

Claim—1st, The employment in connexion with the type cylinder of a cylinder or rotary printing press, of a flattened plate or type bed in which the type, to produce the printed impression upon the paper, are placed, which plate or type bed is revolved with that cylinder, and is so connected with and attached to it as to have the face of the type contained in it move over the impression roller in the arc of a circle. 2d, The feeding roll, operated by a positive motion, as specified, when combined with, and elevated and depressed by, the arms and cams, in the manner described. 3d, The feeding guide, o, operating in connexion with the feeding roll, as set forth.

128. Portable Field Fence; Archibald B. and Madison Vandemark, Phelps, New York.

Claim—The placing the locking batten on the same side of the rails with the end batten, and its combination therewith and with the locking batten and end batten, and forming a lock, substantially as described.

129. Mode of Filling Water Tanks at Railway Stations; Charles Weed, Milledgeville, Illinois.

Claim—The combination and arrangement of the yielding track with the compound levers, connecting bars, or their equivalents, weighted segment lever, ratchet pinion, and gear wheels, as required, for giving motion to pump lever.

130. Screw Cutter; Thomas Whitaker, Cincinnati, Ohio.

Claim—The combination of the shaft, the sheaves, the yokes, and the guides with the dies, when arranged substantially as described.

131. Apparatus for Raising Sunken Vessels; Aldridge Windham, City of New York.

Claim—The combination of the rigid and elastic inflatable air vessels, together constituting the raiser when so united, and so small as to be conveniently carried by any vessel which they can raise. Also, the portable shoe, so constructed of wood and iron, or other material, as to be manageable under water, so as to be easily applicable to the sunken vessel to receive the cable for raising, and protect the vessel from abrasion or jamming by the cable. Also, the inflatable elastic stopper, so constructed as to be easily thrust through a leak or opening in the vessel, and afterwards inflated with air, which stops the opening, so that the sunken vessel may be exhausted of water to assist its raising.

132. Guard Fingers for Harvesters; John W. Brokaw, Assignor to Warder, Broker & Child, Springfield, Ohio.

Claim—The peculiar construction of the cap, when made of wrought or malleable iron, and connected to the cast iron base and to the finger bar, in the manner set forth.

133. Mode of Launching Vessels; Gordon Conkling, Assignor to W. T. Conkling, Conklingville, New York.

Claim—The runners, balls, and ways, combined and arranged substantially as set forth.

134. Pressure and Vacuum Valve; William Hardy and John Parkinson, Assignors to selves and Aaron Bates, Philadelphia, Pennsylvania.

Claim—The valve chamber, spring valve, and inner valve, with their respective openings and passages.

135. Car Seats and Couches; Alexander M. Holmes, Assignor to self and Albert G. Purdy, Eaton, New York.

Claim—The combination and arrangement of the specific devices set forth, substantially as described.

136. Sewing Machines; George W. Hubbard, Assignor to self, Walter Hubbard, W. L. and N. L. Bradley, Meriden, Connecticut.

Claim—The looper composed of the fixed plate, the elastic plate, and the hook, applied to be operated by, and to operate in combination with, the needle.

137. Machinery for Drawing and Twisting Wool; John W. Kennedy and John T. Plummer, Plainfield, Assignors to selves and John Batchelder, Lisbon, Connecticut.

Claim—1st, The combination of the tubes, the toothed drawing rollers, and the convolute groove, to effect the draft and twist simultaneously, or either alone. 2d, Making the upper part of the frame which carries the back drawing rollers and the rollers, or their equivalents, which carry the roving to be drawn and twisted, adjustable vertically.

138. Stone-holding Machines; Eleazor B. Knight, Assignor to self and Nathan Kellogg, Malden, New York.

Claim—1st, A box or holder, detachable from its guiding or supporting frame, and provided with sets, and means as recited for holding stones or other substances, to be operated upon in being rubbed or ground, and which can be adjusted to plain or beveled edges, and for angular pieces. 2d, The angular guides or standards, as arranged for keeping the box or holder in its proper position in relation to the rubbing bed. 3d, The adjustable rests or supports for keeping the box or holder at any point desired.

139. Raking and Binding Apparatus for Harvesters; Allen Sherwood, Assignor to E. P. Senter, Albert Goss, and Daniel Woodworth, Auburn, New York.

Claim—The traversing the double rake made to rock in its supports, to bring its fingers into and out of action, and automatically fastened and released. Also, in combination with the fingers for throwing the gathered gavel up into the concave, the arm for carrying the binding wire up and over the sheaf, and placing the wire in the slot of the twisting wheel. Also, in combination with the twisting wheel, the sliding knife for cutting off the wire. Also, in combination with the cutter bar and its stud, the cam, for the purpose of causing the cutter to act, regardless of the direction in which the shaft that carries the cam turns. Also, in combination with the wire carrier and guides, a twisting wheel, made and operated as described. Also, forming a knot or enlargement on the end of the wire, behind where it is cut off by the cutter, by twisting that portion of it by the means substantially as described, said twist preventing the end from being drawn through the slot of the twisting wheel.

140. Pin-sticking Machine; Cornelius W. Van Vliet, Assignor to the New England Pin Company, Winsted, Connecticut.

Claim—1st, The combination of the series of channel ways with the sliding separator, when constructed as described. 2d, The combination of the punches with the sliding separator, when constructed as set forth.

3d, The combination of the crimping bars with the punches, sliding separator, and channel ways, when constructed as described.

141. Harrows; Samuel White, Penfield, Assignor to Harlow Herrick, La Grange. Ohio.

Claim—The adjustable plates, C C, in combination with the revolving shafts, E E′ E″, and in connexion therewith the spur wheel, K.

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142. Lock; Christian Ackerman, Newark, New Jersey.

Claim—The use of the fall and lever in their combination with the eccentric moving bolt, when constructed as set forth.

143. Gas Regulators; Salmon Bidwell, Chicago, Illinois.

Claim—The cock, operated by the diaphragm, rod, and spring, as described.

144. Brick Machines; John Booth, Mobile, Alabama.

Claim—The chambers separated by the perforated floor, in combination with the spring blade, scraper, and reciprocating mould carriage

145. Shears; Joseph A. Braden, La Grange, Georgia.

Claim—Making the blades of triangular form in their transverse sections and fitting them to the handles, so as to be capable of being turned therein to present three different pairs of edges in an operative position.

146. Plough Press and Drill; T. E. C. Brimby, Simpsonville, Kentucky

Claim—The press, in combination with the drill for pressing and drilling the mould-boards of ploughs.

147. Truss Pads; C. Campbell, St. Louis, Missouri.

Claim—The application of pads made of gutta percha, in the manner described, for the prevention of the escape of viscera through hernial openings in the human body.

148. Portable Field Fence; P. S. Carhart, Collamer, New York.

Claim—1st, Constructing the panels of a portable fence, having their bearings on sills, or their equivalents below, shorter at their tops than their bottoms. 2d, In combination with panels constructed as described, the sills provided with one or more cross blocks, arranged to project between or on either side of the end battens of the panels, to support and guide them. 3d, The employment for tightening up the panels and uniting them firmly and expeditiously with the sill of the key or wedge, in combination with the brace or strap.

149. Rotary Pump; M. R. Clapp, Seneca Falls, New York.

Claim—The combination and arrangement of the revolving toothed pinion and cylinder, with the abutment, or its equivalent, cylindrical case, and internal gearing.

150. Nut Machine; R. H. Cole, St. Louis, Missouri.

Claim—1st, The arrangement of two knives whereby they are made to act simultaneously on each side of the bar, so as to cut the nut blank entirely off and deposit it between the vibrating jaws or formers. 2d, The arrangement of the vibrating dies or formers, whereby they are made to press the sides of the nut to the required form while carrying it from where it is cut off to where it is to be punched on the die. 3d, The spring, as arranged with the aforesaid jaws or formers, whereby they are opened by a yielding force. 4th, I do not claim facing the dies or punches with steel, as they are both made entirely of that metal—but I claim making them in three separate pieces or parts, substantially as described, so that I can renew one part and retain the other so as to economize material.

151. Raking Attachment for Harvesters; P. S. Crawford, Marengo, Illinois.

Claim—The combination of the rakes, O P, the former being attached to the box, and the latter operated through the medium of the gearing placed within the box, and the bars and arm. Also, the supplemental or discharging rake placed over the rake, and used in connexion with the springs of rake.

152. Expansible Floats for Life-boats; Charles Legros, City of New York.

Claim—Constructing the outer sides or side surfaces of the floats of some non-corrosive metal, while the top and unexplored surfaces are formed of rubber or other air-proof flexible material.

153. Roofing Cements; G. W. Cushing, Chicago, Illinois.

Claim—The roofing cement composed of asphaltum, coal tar, and the residuary gum specified, combined in about the proportions stated.

[The component parts of this cement are asphaltum, coal tar, and the pitchy residue known as "residuary gum," which is separated from the fatty substances in the manufacture of stearic acid for what are known as "star candles," or for other purposes.]

154. Inkstands; Samuel Darling, Bangor, Maine.

Claim—An inkstand, with a dripping cup or reservoir, arranged and constructed substantially as described.

155. Burglars' Alarm; A. W. Decrow, Bangor, Maine.

Claim—The slides, D E F, tumblers, G H I, bar or bolt, J, and an alarm formed of the clock movement and bell, combined and arranged to operate as set forth. Also, the particular manner, as shown, of operating the tumblers, G H I, from the slides, D E F, to wit: by means of the oblique ledges formed on the slides, and the adjustable pins which pass through the tumblers, whereby the tumblers are not only actuated but changes also allowed to be made, so as to require a varying movement of the slides in order to throw back the bolt. Also, connecting the tumbler, G, and bolt, J, with a bar, L, to serve as a check or supplemental device to give an alarm, in case an attempt is made to open the drawer by force, or otherwise, without tampering with the slides, D E F.

156. Machines for Sorting Silk or other Thread according to its Size; Ira Dimock, Mansfield Center, Connecticut.

Claim—1st, A device by which the varying thickness of the thread is made to shift a traversing guide, or its equivalent, to distribute the thread upon a winding apparatus according to its thickness, consisting of two surfaces, one of which is caused to receive a reciprocating motion through the agency of variations in the

thickness of the thread passing between them—whether the said surfaces consist of the peripheries of an eccentric wheel and roller, as represented in the drawing and described, or have any other form which permits of their operation in an equivalent manner. 2d, The movable carriage with its opening and notches, applied in combination with the series of spools, and the bobbin or winder on which the thread has been distributed and arranged according to its size or thickness, and operating substantially as described, to stop the winding operation as the unwinding of the thread from said bobbin or winder varies beyond certain parts thereof.

157. Cigar Wrappers; Henry Durell, Morisiana, New York.

Claim—The removal of the coloring and flavor of the plant, by means described, then reducing to pulp and thence to paper the fibrous or woody parts of the plant in any known way, and then re-charging said paper with the solution or volatile matters previously removed therefrom in order to prepare said paper to be used as wrappers for segars.

158. Machines for Washing Coal; J. P. Evans, Borough of Hazelton, Pennsylvania.

Claim—1st, Forming a series of slits at the lower end of the corrugations, next the triangular openings, so as to enable the thin pieces of slate to discharge themselves automatically through them. 2d, The combination and arrangement of a tappet or tappets, with and in the relation to the corrugated bottom of the chutes, and the slits, and triangular openings at the lower ends of the same, over which they are suspended, as set forth, the said tappet or tappets being provided with adjustable weights to regulate their resistance to the coal. 3d, The arrangement of the upright pipe and right-angled perforated pipe at its lower end, in the relation to the corrugated bottoms of the chutes described, said perforations being formed on the lower portion of its periphery, as stated, for subjecting the coal to a thorough washing in its descent, as set forth.

159. Pumps; S. H. Gray, Bridgeport, Connecticut.

Claim—Having the upright or stand of the pump handle provided with a claw or hook at one side of its lower end, and having a bolt pass through the lower part of the upright or stand, the bolt being provided with a curved or hook-formed head, the above parts being used in connexion with flanch on the upper end of the pump cylinder. Further, in connexion with the upright or stand, the cover, arranged as shown, so that it may be secured to the cylinder by the upright or stand, as described.

160. Pumps; Foster Henshaw, Washington City, D. C.

Claim—1st, Operating the piston by a curved slot possessing the characteristic features described and arranged, or formed in a vibrating handle. 2d, In the construction of lifting pumps, the combination of three or more valves. 3d, The arrangement of washers, formed as specified, with the series of valves. 4th, Casting in the well pipe a series of steps.

161. Apparatus for Applying Soles to Boots and Shoes; Jacob Jenkins, Charlestown, Massachusetts.

Claim—The application of the rocker jaws or jaw-holders to the elastic bed, whereby the latter when forced downward is made to draw the jaws towards one another, in manner as explained. Also, the combination of the elastic cushion or sole pressure with the elastic bed, and a mechanism for forcing the shoe down upon the said bed. Also, the combination of the rocker-bearer and its screws with the holding lever, or its equivalent, and to operate therewith. Also, the contrivance shown in figs. 7, 8, and 9, and as above described, to be used in manner specified.

162. Dentists' Chairs; Alex. M. Holmes, Morrisville, New York.

Claim—1st, The foot-rest arranged with the slides, racks, pinions, and pawls, substantially as described. 2d, The supplemental back attached to links which are fitted in the slot of the back, and actuated by the set-screw, substantially as set forth. 3d, The adjustable head-rest formed of the slide, pinion, plates, arranged relatively to each other and applied to the back, substantially as set forth.

163. Smut Machines; Hiram Hopkins, Evansville, Indiana.

Claim—The scourer constructed of the vertical bars provided with radial projections at their inner sides, and the arms provided with ledges and attached to the shaft, when said scourer thus constructed is enclosed by a box, and arranged relatively with the blast spouts and fan, to operate as set forth.

164. Washing Machine; H. R. Juno, Millport, New York.

Claim—The combination of the revolving rubber having alternate slats and receding boards, as described, with the rubber. Also, the elastic pivot rod, operating in the manner set forth.

165. Needles for Knitting Machines; J. K. Kilbourn, Pittsfield, Massachusetts, and E. E. Kilbourn, Norfolk, Connecticut.

Claim—The improved knitting needle having a secondary groove in its stem, substantially as set forth.

166. Machine for Cutting Metal Bars; D. R. Knowles, Centre Groton, Connecticut.

Claim—The bed piece provided with the clamp, B, block or rest, C, slide, D, having the cutting tool attached and connected with the lever, G, in combination with the automatic feed movement formed of the adjustable lever, H, pawls, ratchet, and screw shaft, connected with the block or rest, C.

167. Brush Cylinders for Spreaders, Cotton Gins, &c.; A. M. Lampher, Gloucester, New Jersey.

I am aware that metallic fans have been used on the ends of a cylindrical brush in the cotton gin, as described in E. Carver's patent, and I am also aware that brushes have been arranged around the periphery of the end of the cylinder, and that such an arrangement was patented by B. D. Gullet, in 1858—but while I believe I can prove priority of invention over Gullet, I deem my arrangement essentially different from an improvement upon his, as it combines the advantages of the fans of Carver, with the protection against fire attained by Gullet. I therefore

Claim—The brushes on the ends of the cylinder, when arranged substantially as above described, for the purpose of preventing the filaments of cotton or other fibrous substance from becoming entangled in the journals and for preventing accidents by fire.

168. Self-acting Wagon Brake; A. Larrowe, Cohocton, New York.

Claim—Constructing the rubbers with the flanches on each side operating loosely in grooves in bar, B, and resting on springs, h, for allowing the rubber to rise upon an inclined plane, and relieve the friction of the wheels when backing the wagon and for replacing the rubbers.

169. Horse Shoe; John Maddock, Bloomington, Illinois.

Claim—A nailless horse shoe, provided with lugs, or their equivalents, formed on the upper side of the sole, when used in connexion with corresponding projections formed on the inner side of the upper flanch, the former being made to fit cavities formed in the horse's hoof, and the latter into grooves formed for their reception in the sole, the whole being secured together in the manner substantially as set forth.

170. Canal Boat; John McCausland, Kingston, and Jefferson McCausland and James McCausland, Esopus, New York.

Claim—The construction of canal boats and other flat-bottomed and vertical-sided vessels by, 1st, Interposing the bilge timbers between the floor timbers and the side timbers, substantially as and for the purposes set forth. 2d, Beveling the edge of the bilge timbers and forming a face on either side of the beveled face for the fitting on of the bilge plank in a gradually rounding line, as described. 3d, The second dovetail in the side timbers, with the chock between the dovetailed faces and the bilge timber, as an arrangement of means for adding strength to the vessel, as set forth.

171. Machines for Cutting Grass, &c.; C. H. McCormick, Chicago, Illinois.

Claim—The combination of the sickle having the scolloped or indented edge and serrated teeth, with a continuous series of fingers having the back reversed angles for supporting the grain or grass to be cut to the edge of the sickle, both above and below the edge or above the edge only. Also, cutting out the middle of the upper part of the fingers that project over the sickle, in combination with the vibrating sickle, as described.

172. Harvesters; McClintock Young, Jr., Frederick, Maryland.

Claim—The combination of the handle, shaft, arm, pitman, and guide, or their equivalents, when arranged in the manner specified. Also, making the gatherers adjustable on the arms of the reel, as specified.

173. Mode of Preventing Nuts from Unscrewing; S. Noblet, Halifax, Pennsylvania.

Claim—Preventing bolt heads or nuts from turning by inserting below them a flexible metallic washer, one end of which is turned against the head or nut, and the other held immovable in place.

174. Churn; Andrew Ralston, West Middleton, Pennsylvania.

Claim—The arrangement of the openings in the circular part of the fan or beater case, the valve, x, the gathering valve, h, the conductor, u, as described.

175. Lamps; C. Reichmann, Philadelphia, Pennsylvania.

Claim—In combination with the lamp, the slotted open bell-shaped cap, when so constructed as to allow light to be deflected downward, substantially in the manner set forth.

176. Rotary Harrows; Jabez Robins, Boston, Massachusetts.

Claim—The two harrows placed one within the other, and connected by the concave rollers and bead, in connexion with the draft beam and frames, provided with the rollers or weights.

177. Water Wheel; Alpha Smith, Sanquort, New York.

Claim—Constructing the bucket with ledges or prominences, the buckets being curved and fitted between the shells which form the body of the wheel, and arranged relatively therewith.

178. Rotary Valve for Steam Engines; Thomas Stewart, Philadelphia, Pennsylvania.

Claim—1st, Making a rotary valve with an independent cut-off applied thereto, constructed substantially in the manner set forth. 2d, Constructing the said rotary valve with two or more sets of ports or ways therein, for the induction and eduction of the steam, so as to enable me to cut off the said steam at any required part of the stroke, without producing any connexion with the opposite side of the piston when the steam is cut off short, as set forth.

179. Rotary Harrows; Salathiel S. Thompson, Heller's Corners, Indiana.

Claim—Attaching the toothed wheels to the frame formed of the bars, hinged together or connected at their front ends by a swivel joint, and having their back parts attached to bars connected by a pivot and secured in proper position by the segments and pins.

180. Eyelet Fastenings for Ladies' Skirts; W. S. Thomson, City of New York.

Claim—The use of the H-shaped washer or fastener, or equivalent, in combination with an eyelet as a means of fastening together the straps and hoops of elastic skirts.

181. Cotton Gins; John L. Tuttle, Bridesburgh, Pennsylvania.

Claim—So combining a toothed cylinder with an open breast that allows the fibre to pass through it, but holds back the seeds, as that the cylinder shall work against the edge of said open breast, and carry the fibre past it, whilst the seeds shall roll up against the surface of said breast, and draw the lint that has not been taken from them up through the openings, whence they are turned over and returned again and again by the action of the cylinder to the breast until divested of all their fibre.

182. Corn Planters; Charles Van Houten, Sunbury, Ohio.

Claim—1st, The employment of the hinged, adjustable, and laterally sliding hopper and share frames, furnished with a spring stop or catch, in combination with a long transverse pinion and the propelling axle. 2d, The combination of the hinged grated apron with the sub-soiling covering shares and furrow opener.

183. Machine for Cutting Veneers; Gilbert Bishop, Fairfield, Connecticut, Assignor to Edward White, City of New York.

Claim—1st, The cutting of veneers from opposite sides of the log by knives, arranged and operating in opposite directions, so as to cut with the grain of the wood. 2d, The construction and arrangement of the diagonally-faced side pieces and the sliding frames in connexion with the knives, so as to give the thrust of the knives into the centre of the log, and thus cut the veneer clear from the log. 3d, The arrangement of the wheels, in combination and connexion with the sliding frames and knives, so as to produce the drawing cut at the same time that the knives are being thrust in upon the log. 4th, The combination and arrangement of cam, the pair of bars, the connecting rod, vibrating arm, and pawl and ratchet, so as to operate in the manner described, to raise or lower the feed screws.

184. Apparatus for Coloring Paper, &c.; Charles Williams, Philadelphia, Pennsylvania.

Claim—Distributing or laying the color in the process of marbling or coloring paper, by means of an apparatus constructed so as to operate substantially in the manner described.

185. Skate Irons; C. A. and Robert Williams, and G. A. Morse, Bloomfield, Maine.

Claim—That portion of skate studs (solid to their runners) above the collars, upon which is cut the screw thread, in the manner substantially as set forth.

186. Gas Burners; A. H. Wood, Boston, Massachusetts.

Claim—The combination with a gas burner of metallic flanches or spreaders, arranged near and above the orifice of the burner, as described, for the purpose of spreading the flame and consuming the impurities of the gas, whereby the orifice is kept clear—and this I claim whether the conducting rods be used or not.

187. Saw Mill; John Pemberton, deceased, Assignor to Lemuel Pemberton, Jonesborough, Indiana.

Claim—I do not claim as new the devices below enumerated, but simply their relative arrangement, as specified, for the purposes set forth, to wit: 1st, The roller, T, ropes, t and u, to raise the bars, M and M′, in combination with the pin, b, slide, X, lever, W′, bar, N′, and rock shaft, P, with its arms, rod, q, and lever, q′, the whole being so constructed and arranged as to throw the feeding out, and the backing devices into gear, by operating the lever, e′, and move the gate or valve to reduce the speed of the mill at the proper time, or after the saw cuts through the log. 2d, The arms, J, rock shaft, s′, and bar, S, in combination with the projection or stop, e, connected to the lever, E, or its equivalent, to turn the ratchet wheel shaft and traverse the rack to set the log, as described. 3d, The ratchet wheel, F′, bent lever and pawl, G, in combination with the pin, f, or its equivalent, in the lever, F, to stop the ratchet wheels when they have moved far enough, so as to prevent the log from being moved too far when it is set for a new cut. 4th, The pin, u, in the head block, and slide, X, in combination with the lever, W, which releases the hook, V′, to let M′ M descend to increase the speed of the mill, as described. 5th, The rod, a, and stop, L, in combination with the slide, Y, and lever, U, so constructed and operated as to hold up the bar, M, after the log is sawed, and prevent it from descending and increasing the speed of the mill, and at the same time stop the apparatus which sets the log.

188. Tea Pots; Wm. Austin, Assignor to self and Wm. Obdyke, Philadelphia, Pennsylvania.

Claim—The plunger or presser, in combination with the interior casing, the whole being arranged in the manner set forth, or any equivalent to the same.

189. Automatic Paper Feeder for Printing Presses; Wm. Bullock, Assignor to George W. Taylor, Newark, New Jersey.

Claim—Operating the hands, or their equivalents, which effect the feeding of the sheet of paper, in manner substantially as set forth, so that they have a greater capacity for moving the sheet than is necessary for the purpose. Also, controlling the operation of the hands, or their equivalents, upon the sheets of paper, by mechanism whose operation is dependent upon the position of the sheet being fed, so that the length of time during which the hands, or their equivalents, are permitted to act upon each sheet of paper does not bear any fixed relation to the movements of the other parts of the printing press. Also, intermitting the operation of the hands, or their equivalents, upon the paper, while the latter is being drawn into the press by mechanism acting substantially as set forth. Also, effecting the progressive movement of the pile of paper, by mechanism whose operation is dependent upon the position of the pile. Also, the combination of the flap guides and nozzles, or their equivalents, for stopping the movement of the forward edge of the sheet, and for releasing the same in the manner described. Also, moving sheets of paper by automatic rubbing hands, or their equivalents, constructed substantially as set forth. Also, operating the stop-cocks of the air cylinder and the flap guides by a cam, or its equivalent, whose movement is coincident with, or bears a fixed relation to, the movement of the fingers which draw the paper into the press.

190. Sewing Machines; Jonas Hinkley, Huron, Assignor to self and F. A. Wildman, Norwalk, Ohio.

Claim—1st, The method of operating the feeding arm or cloth mover, by the combined action of the pivoted bow, pressing lever, flexing strap, and vibrating plate, or its equivalent, as set forth. 2d, Mounting the vibrating plate which imparts motion to the loop-forming hook and feeding mechanism upon spring arms, arranged at right angles to a longitudinal spring for balancing said plate in its vibration. 3d, Mounting the spool upon a spindle having elliptical-shaped springs, which extend into and through the eye of the spool, as specified.

191. Machines for Pegging Boots and Shoes; B. F. Sturtevant, Assignor to self and Elmer Townsend, Boston, Massachusetts.

Claim—1st, Causing the hammer to descend each time a peg is driven a short distance below the stationary rest, for the purpose of compressing the soles, as set forth, and of relieving the shoe from contact with the rest, that it may be fed forward, as described. 2d, The arrangement of the hammer, X2, and stationary rest, H, constructed and operating as described, in connexion with the weighted lever. 3d, The peculiar holder for the blank, the same having several knife edges lying in the direction of the feed, operating in the manner set forth, to hold the last peg of the blank whilst it is being separated from the one preceding it. 4th, And in combination with the holder, the pawl, operating upon several points of the blanks, in the manner set forth. 5th, Sawing off the pegs in the machine by a saw operating into and through the trough, through which the pegs are fed. 6th, The spring in the end of the trough, operating as described.

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192. Corn Shellers; A. Adams Sandwich, Illinois.

Claim—The combination of the yielding plate and guide bar or plate with the wheels and spout, provided with the elastic plate, when these several parts are constructed and arranged for joint operation, and relatively with respect to each other and to the discharge passages, in the manner set forth.

193. Seeding Machines; George C. Bunson and Cyrus Roberts, Belleville, Illinois.

Claim—1st, The employment or use of the cylinder, provided with step-like projections between circumferential flanches, oblique partitions, and zigzag grooves, said cylinder being fitted within a cylindrical case at the bottom of box, D, and having a reciprocating rotating motion. 2d, The arrangement of the adjustable tubes attached to the arms, as shown, the rollers and cutters whereby both the cutters and tubes may be adjusted as desired, and the pressure on the cutters graduated as desired, as also the depth of the furrows made by the cutters.

194. Machine Belting; John H. Cheever, City of New York.

Claim—The manufacture of belts or bands of a combination of india rubber or gutta percha with wire cloth or netting, or strands of wire.

195. Expansive Bit; Wm. A. Clark, Bethany, Connecticut.

Claim—1st, The combination of the follower, beveled upon its under side, in such a manner that driving it home against the cutter shall crowd it upward, with a lip or shoulder above it upon the shank, which lip or shoulder is so formed that this upward pressure mentioned shall crowd the upper edge of the follower in against the seat back of it, when the upper edge of the follower is beveled to correspond, as set forth, for the purposes stated, the follower being brought home to its place by a screw, or in any equivalent manner. 2d, So arranging the movable and stationary cutters in relation to each other and to the other parts, that all the chips made by the instruments shall be delivered upon one and the same side of the shank of the bit, thereby allowing the back side of the shank of the bit to be left entire.

196. Ploughs; David Cockley, Lancaster, Pennsylvania.

Claim—The adjustable cutter wheel, cleaner, and devices, V X Y Z, when arranged with the regulator in combination with the beam Also, the manner of arranging and fastening the point, share, and landside with its cutter, so as to hold them with the short screw and plate, in combination with the mould-board and beam.

197. Making Nut Blanks; Richard H. Cole, St. Louis, Missouri.

Claim—Preparing the nut blank by driving a punch into it while it is confined against a blank surface, by means of the mechanism constructed and arranged substantially in the manner set forth.

198. Couches for Railroad Cars; J. B. Creighton, Tiffin, Ohio.

Claim—The combination of the couches, folding partitions, stretchers, slatted supports, hooks, and pins, the whole being arranged in the manner set forth.

199. Sugar Mills; Samuel L. Denney, Lancaster County, Pennsylvania.

Claim—The combination of eccentric bearings, their arms, connecting rod, lever, sliding belt, hand piece, and arch, or their equivalents, substantially in the manner set forth.

200. Attachment for Tackle Blocks; George Focht, Reading, Pennsylvania.

Claim—So attaching a tackle block that it may turn freely in all directions, and be retained in the proper relative position with the rope when the strain on the rope ceases, in the manner described.

201. Tempering Steel Car Springs; Perry G. Gardiner, City of New York.

Claim—1st, The subjecting the oil or fluid divided into streams or showers to the contact of a blast of cold air while falling, by means of the cylindrical chambers or compartments, and the cylindrical air chamber, operating as described. 2d, The construction, arrangement, and combination of the cylindrical chamber, G, the cylindrical chamber for distributing the air, H, and the disk and perforations, as described. 3d, The arrangement and combination of the tanks, A B, and the coils of tubes or worms, the chambers, G H, and their connexions, operating together, so as that at the same moment the oil or fluid is subjected to the cooling by both air and water, as described.

202. Compound Railroad Axles; I. P. Garrett and Daniel Steckel, Mercer Co., Pennsylvania.

Claim—A compound axle, the main portion of which extends through both wheels, and equals in length the width of the track, and is reduced in size from the centre to one end, in combination with a tubular axle of half its length, in which the reduced part of the main axle revolves, as in a journal, one wheel being secured to the main axle, and the other to the tubular part, arranged substantially as described.

203. Metallic Frames for Vault Lights; Michael Grasz and Peter H. Jackson, City of New York.

Claim—The ∩-shaped metallic bars receiving the glasses, in combination with the wrought iron bars of a grating, over which the said ∩-shaped bars set and are sustained, substantially as specified.

204. Cracker Machine; J. and J. C. Holyland, Rochester, New York.

Claim—The arrangement and combination of the socket, arm, spring, and rod, as described.

205. Mowing Machines; George F. and Moses Jerome, Mineola, New York.

Claim—1st, The caster wheel, when attached by the shoes, or their equivalents, by having its arbor pass loosely through a socket attached to the cross-bar, and having a swivel at the upper end of the arbor, so that by the aid of pulleys, or other guides, and a chain or cord, the weight of the finger bar and sickle will be transmitted to the caster wheel, and the finger bar and cutter raised and lowered, while the caster wheel is allowed to turn freely in any direction without affecting in any degree its concomitant parts. 2d, The lever and spring, in combination with the chain or cord, caster wheel, and shoes, when the whole are arranged substantially as set forth.

206. Combined Cooking Range and Heating Apparatus; Charles Kane, City of New York.

Claim—The arrangement of an air chamber under the whole range, with a flue or flues connecting it with the hot air chamber, together with the double flues in double tiers between the air chamber and the bottom of the ovens, through and in which last mentioned flues the combustible gases and smoke circulate before reaching the smoke flues.

207. Balance Sail Rig for Ships; John Lewis, Elizabeth City, New Jersey; patented in England, September 4, 1855.

Claim—The spring beam applied between the pyramidal frame or shears and the sides of the vessel, and connected to both the frame and vessel, in substantially the manner specified. Also, constructing a frame to receive sails by the horizontal yards. combined with the double ranges of spars and braces, whereby the said yards are permanently sustained at the desired distances apart, and a clear space is left from end to end of said yards for spreading the sails, without their coming in contact with the said spars and braces. Also, the sail frame, constructed as aforesaid, and combined with the pyramidal shears by the joint near the middle of said sail frame, whereby the aforesaid sail and frame are sustained, and permitted to be turned in the manner and for the purposes specified.

208. Method of Heating Ovens by Steam; Hamilton Lyon, Cincinnati, Ohio.

Claim—The combination of the pipes, chambers, and exhaust, or their equivalents, arranged substantially in the manner set forth.

209. Mechanical Power; Elisha Matteson, Troy, New York.

Claim—The arrangement of gearing, in combination with the shaft, weight, and wheel, substantially as set forth.

210. Harvesters; David S. McNamara, North Hoosick, New York.

Claim—1st, Constructing the frame of the machine of the bars, end piece, and finger bar, in connexion with the trusses, substantially as set forth. 2d, In combination with the frame, constructed as above, the shoe, when constructed as described, and secured to the finger bar and end piece, in the manner set forth..

211. Dredging Machine; Abel Minard, City of New York.

Claim—1st, The combination of the spring catch, lever, and curve, with the lid or shutter of the bucket, for the purpose of tripping the lid to empty the bucket of its contents, as described. 2d, The attachment of the dredge wheel, the engine, and chute, to the hinged frame or platform, as described, which attachment allows the chute to retain its relative position to the dredge wheel at all points of the latter's elevation, and the engine to be connected to the wheel to work it at all points of its elevation, without the intervention of other connexions or gearing than that shown.

212. Cast Iron Car Wheels; Hiram W. Moore, Jersey City, New Jersey.

Claim—My described cast iron car wheel, the hub of which is made of an inner and outer straight cylinder joined together by concentric plates at their ends, and an intermediate plate between, for imparting great strength and durability to the wheel, and in combining and uniting such hubs to the rim or tread by straight plate radiating therefrom, between the end of the hub and intermediate disk, or connexion otherwise formed in order that every portion of the wheel may be of a uniform thickness to cool even, be durable, and cheaply constructed, and to render hooping of the hub unnecessary.

213. Ambulance Wagon; Israel Moses, City of New York.

Claim—An army ambulance, having ability to transport the sick and wounded under cover, either lying or sitting, by means of a system of sectional folding seats, arranged along the sides, as described, as also for carrying the surgeon's medicines and implements in removable cases, fitting in and under said seats, and arranged in drawers under the body of the vehicle, so that said cases may be used for general or detached service, as required; and also the arrangement of an adjustable door, capable of serving as a table, as set forth, together with the arrangement described of the hammock for one, two, or more persons; and finally, in combining with the vehicle as a central support, the tent necessary for the hospital camp, the whole being combined and operating as a connected device for transporting, subsisting, and protecting the sick and wounded of an army, and their appropriate attendants, as set forth.

214. Key-hole Stop; John Moulson, Philadelphia, Pennsylvania.

Claim—The construction of a key-hole stop, consisting of two pieces of metal, one to slide into the other, which, when introduced into a key-hole, first the female and then the male piece, in conjunction with a lug on one piece and a padlock on its equivalent, through both pieces, all combined as described, or their equivalents, will fill the key-hole and effectually prevent depredations on locks, by preventing the introduction of any unwelcome key or other instrument therein.

215. Lamps; W. Mulholland, Brooklyn, New York.

Claim—The arrangement of the central air tube, B, extending through the body, A, of the lamp, and communicating at its lower end with the rack, a, provided with a register, C, and perforated plate, a, with the wick tubes, c c, placed at opposite sides of the air tube, B, and the perforated cap, D, provided with the deflector f, as set forth.

216. Machine for Planing Irregular Surfaces; James H. Nelson, Oskaloosa, Iowa.

Claim—The combination of the elastic or yielding frames, B B I, provided respectively with planers, G G, and feed rollers, K, and arranged relatively with each other, so as to operate as set forth.

217. Bread and Cracker Machines; Wm. R. Nevins and Joseph J. Yates, City of New York; patented in England, March 13, 1857.

Claim—1st, Extending the endless apron, H, for the conveyance of biscuit or crackers, and oval or angular bar, J, over which it passes, beyond the end of the frame, A. and arranging the same in the relation to the hexagonal roller over which the endless metallic apron, H′, of the oven passes, and which has a corresponding intermittent progressive motion with the endless apron, H, in the manner described. 2d, Combining and arranging with the lower endless apron, H, in the relation described, the upper endless apron, D, for separating the scraps from the biscuit, as described, the two aprons, H D, being made to move together by means of the ratchet wheels, notched bars, and oscillating arm or bar attached to rock shaft, which may be actuated by an eccentric or other convenient means, as set forth.

218. Bakers' Oven; Wm. R. Nevins and Joseph J. Yates, City of New York; patented n England, March 13, 1857.

Claim—The combination and arrangement of the endless apron, H′, and hexagonal rollers, H, to which an intermittent progressive motion, corresponding with the motion of the apron of the cracker or biscuit-cutting machine, is given, horizontal flues and bridge wall between the lower flues and furnaces.

219. Machine for Adding Numbers; John B. Newbrough, St. Louis, Missouri.

Claim—The obstructing wheel, containing a successive number of slots corresponding to the circles of figures on the dial, when arranged in combination with the dial, to produce the result as shown.

220. Machines for Sawing Marble, Stone, &c.; James Norman and Aaron R. McLean, West Dresden, N. Y.

Claim—The carriage, as constructed of the parts, E E′ and F F′, with the means for holding and adjusting the same, and for holding and adjusting the stone thereon, in combination with the endless saw.

221. Revolving Fire Arm; Wm. Palmer, City of New York.

Claim—The combination of the trigger, hammer, seer or hair trigger, and slotted plate, or its equivalent, whereby the hammer is cocked by the pull of the trigger, and then disconnected therefrom, so that the strain is transferred from the trigger to the hair trigger, and then the latter is disconnected by the further pull of the trigger, as set forth.

222. India Rubber Car Springs; Sanford Peatfield, Ipswich, Massachusetts.

Claim—The application in the construction of car springs, of the combination knit and rubber fabric specified, in the following manner, to wit: the combination knit and rubber fabric being wound in several layers tightly round a central axis or "former," or placed flatwise, layer upon layer, over the axis or former, and afterwards pressed and acted upon by heat until it becomes a compact or united universally yielding mass, as set forth.

223. Cultivators; Thomas Wm. Poole, Brunswick, Ohio.

Claim—The combination and arrangement of the hinged arms, and fixed concentric guards, in the manner specified.

224. Clothes Drier; Emma T. Porter, Washington City, D. C.

Claim—The combination of the adjustable frame and supporting braces, with the pivoted stand or foot-piece, substantially as specified.

225. Lamps; Wm. H. Racey, St. Augustine, Florida.

Claim—The case, provided with a cap and used with or without the external case, I, the case and cap being placed relatively with the frame, as described.

226. Riddles for Threshing Machines; F. W. Robinson, Richmond, Indiana.

Claim—The plate with lips or tongues, as described, in combination with slats, for the purposes set forth.

227. METHOD OF LAYING SUBMARINE TELEGRAPH CABLES; Samuel Samuels, Brooklyn, New York.

Claim—Passing the cable from the ship or vessel through the bottom thereof, at or near the point specified. Also, the employment, to conduct the cable to the bottom of the vessel, and to exclude the water from the opening in the bottom where the cable leaves it, of a tube, the whole or the lower part of which has a downward inclination toward the stern of the vessel, as specified.

228. PLOUGHS; B. B. Scofield, Andover, Illinois.

Claim—The arrangement and combination of the pivoted bar, share, landside, standard, curved rack, pinion, and lever, as described.

[This invention consists in combining a sulkey with a plough in such a way that a person while sitting therein, and merely driving the horses, may plough equally as well as by grasping the handles of the ordinary plough, and guiding it by that means.]

229. RAILROAD SWITCHES; Charles L. Spencer, Providence, Rhode Island.

Claim—The use of two frog guiding rails, having the tread rails immovable, but an inside movable section of each guiding rail capable of working simultaneously together, for the purpose of influencing the course of a train of cars when proceeding in one direction, and of preventing injurious consequences in case the switch is improperly set when the train is proceeding in the opposite direction.

230. ROTARY PUMP; B. T. Trimmer, Rochester, New York.

Claim—The construction of the triangular reciprocating butments, working in grooves in the case, f f, with arms clasping around the edge and into the annular recesses of the loose piston, to admit of the butment accommodating itself to eccentric action of the piston without materially obstructing the motion thereof, and at the same time packing against its seat and the periphery of the piston, by the pressure of the water on its double inclined surfaces. Also, the combination and arrangement of the two cylinders or cases, A A, cams, pistons, and butments, with the chambers, C E, and ports, b b and c c, whereby the parts will operate conjointly, for the purpose described, or either cylinder work independently of the other, substantially as set forth.

231. EMBROIDERY AND SEWING STAND; Wm. H. Trowbridge, Saginaw City, Michigan.

Claim—The combination of the plate, the spring, the screws, the thumb-screws, the box, the spool rack, arranged substantially as described.

232. METHOD OF LAYING SUBMARINE CABLES; Owen G. Warren, City of New York.

Claim—The use of a reel immersed in the water to deliver a telegraph cable at the bottom of the sea, constructed and operated substantially as described. Also, the combination of the reel boat with the reel for the convenience of using the brake or operating engine, in the manner described.

233. MACHINE FOR MAKING WIRE SPRINGS FOR FURNITURE; C. A. and S. W. Young, Providence, Rhode Island.

Claim—A single grooved roll, in combination with the upright rod, to effect the coiling of the wire. Also, varying the diameter of the coils to produce a bi-conical form in the spring by causing the roll to approach and recede from the coiling rolls in a direct or curved line horizontally, substantially as specified.

234. LOCKS; T. B. Pye, City of New York.

Claim—The tumblers, slotted as shown, provided with projections, and used in connexion with a shackle, or its equivalent, in combination with the bar and spring, the above parts being arranged to operate as and for the purpose set forth.

235. CHURN; G. L. Farrington, Assignor to D. B. Tiffany, Xenia, Ohio.

Claim—The employment of the double concavo-convex dashers, constructed in the manner specified.

236. BLIND OPERATOR; J. A. Dorman and J. E. Stearns, Assignors to J. A. Dorman, Worcester, Mass.

Claim—1st, The combination of the rod, slide piece, and spring, with the catch plate and knob, when constructed as described. 2d, The manner of holding the blind down in place by combining with the stud, the projection fitting into the recess, as specified.

237. CLOTHES DRYER; E. G. Gibson, Assignor to H. G. Finkham, Oswego, New York.

Claim—The arrangement of the square or box head between the pieces of the arms, as described.

238. HANGERS AND BOXES FOR SHAFTING; F. W. Howe, Newark, New Jersey, Assignor to the Newark Machine Company.

Claim—In combination with such a hanger, the self-adjusting box, in the manner set forth.

239. CUTTING THREADS OF WOOD SCREWS; H. L. Kendall and H. P. Hunt, Assignors to the New England Screw Co., Providence, Rhode Island.

Claim—The cutting of the threads of wood screws by means of chasing tools whose cutting edges have profiles which are respectively counter parts of the body and sloping portions of the screws, and which are caused to act in succession upon the screw blank.

240. SEED DRILLS; Alexander Turner, Assignor to self, R. Bess, and H. Sloane, Franklin, Indiana.

Claim—The arrangement of the seed boxes, the driving, secured as described, and the lever, wheels, rod, and seed slides, the whole being constructed in the manner described.

241. ROOFING MACHINE; E. Wise, Hannibal, Assignor to self and C. L. Wood, St. Louis, Missouri.

Claim—The combination of the adjustable wheel, C, with the two wheels, B B, as described. Also, the combination of the two connecting rods with the lever and the axles. Also, the arranging of the wheels, H′ and H′, against yielding bearings, substantially as described.

ADDITIONAL IMPROVEMENTS.

1. REVOLVING FIRE ARM; F. D. Newbury, Albany, New York; patented June 29, 1858; additional dated September 28, 1858.

Claim—In the construction and use of the trigger, the slot, also the feather with the pin, substantially as described.

2. CORN PLANTERS; Nathaniel Drake, Newton, New York; patented February 2, 1858; additional dated September 28, 1858.

Claim—1st, The rib attached to the upper valve, constructed as described. 2d, Extending the chains

which operate the valves down under the pulleys back of the axle, so as to obviate the slackening and taking up of the chains by the vibrations of the ploughs and their attachments, as set forth.

3. Swing Bolt for Fastening Shutters; J. Gunner, Jr., City of New York; patented Sept. 15, 1858; additional dated September 28, 1858.

Claim—The attachment, when used in combination with the lever, hub, and catch plate, for the purpose set forth.

Re-Issues.

1. Sidewalk Pavements; John B. Cornell, City of New York; patented April 28, 1857; re-issued September 7, 1858.

Claim—Giving such a shape to the described street gutter section, that its under surface will securely embrace the top of the wall, whilst its upper surface at the same time forms a portion of the street gutter, and also a firm supporting base for a section of street curbing, or its equivalent. Also, forming a sidewalk pavement of a series of metallic plates, when the said plates are combined with, or form portions of, sections of metallic street curbing.

2. Trap for Catching Flies; Joel B. Fuller and George W. Pierce, Worcester, Massachusetts; re-issued September 7, 1858.

Claim—The combination of the wheel or cylinder, having a rotary motion, with the box or case.

3. Cartridges; Gilbert Smith, Buttermilk Falls, New York; patented June 30, 1857; re-issued September 14, 1858.

Claim—Making the cartridge case, or at least the cylindrical portion thereof, of some impermeable and elastic substance, such as india rubber or gutta-percha, so that it may be expanded laterally by the force of the explosion of the charge, and will contract itself after the explosion by its own inherent property.

4. Sewing Machines; T. J. W. Robertson, City of New York; patented May 22, 1855; re-issued September 14, 1858.

Claim—1st, So arranging and operating a looper, or its equivalent, that it shall derive its motion from the movement of the needle. 2d, Moving the looper up to and away from the needle.

5. Sewing Machines; James Harrison, Jr., City of New York, late of Milwaukie, Wisconsin; patented April 11, 1854; re-issued September 14, 1858.

Claim—Clamping the thread of the needle at the downward or advancing movement of the needle by the means that are operated intermittingly. Also, combining with the clamping means a set-screw, or its equivalent, for adjusting the clamping means, so that the tightening of the stitch may be regulated to the degree required. Also, the combination of the drag bar attached to the shuttle, and containing the eye through which the thread passes therefrom, the opening for throwing the said bar into position to prevent the delivery of the thread from the shuttle, and the adjustable liberating piece, for preventing the delivery of the thread from the shuttle, and allowing the desired quantity to be given out. Also, constructing the shuttle in two parts, viz: the shell and cap, of which the latter is inserted into and withdrawn from the former, as described,

6. Tackle; Joel Bryant, Brooklyn, New York; patented April 7, 1857; re-issued Sept, 21, 1858.

Claim—The construction and use of winches, whose bosses or drums, turned by cog-wheels, operate in connexion with certain sheaves, wheels, or pulleys, for carrying, operating, and sustaining the fall or tackle used in hoisting or lowering the sails or cargo of vessels on shipboard, substantially as described.

7. Railroad Car Seat; J. B. Creighton, Tiflin, Ohio; patented May 18, 1858; re-issued Sept. 21, 1858.

Claim—1st, The employment of the movable backs of car seats, when used for the purpose of filling up the spaces between the seats, so that a bed may be formed—and this I claim whether accomplished in the manner shown, or in any other manner substantially the same, whereby the same result is accomplished. 2d, The described method of forming and concealing, when not in use, in the spaces between the windows, an upper tier of beds, the same in arrangement with the device constituting the subject of the first claim.

8. Treating Sulphurets; Alfred Monnier, Camden, New Jersey; patented August 11, 1857; re-issued Oct. 6, 1857; re-re-issued September 21, 1858.

Claim—The process of treating native metallic sulphurets or arsenical sulphurets, in connexion with the substances above described, in order to expel all or part of the sulphur and arsenic, for the purpose of obtaining therefrom sulphuric acid, and the metals, as sulphates or oxides.

9. Shingle Machine; James Crary, Middleport, Ohio; patented November 24, 1857; re-issued Sept. 28, 1858.

Claim—1st, The use of two or more froes, arranged substantially as before described, for the purpose of riving two or more bolts from the block of wood at the same time, thus preventing the tendency of the wood to eat out or split too thin at one end or at either side. 2d, The use of brace bars, or their equivalents, so arranged in combination with the froes, as that the froes will encase themselves between them, thus securing the perfect separation and delivery of the bolts from the block. 3d, The use of sliding side pieces with conveying slots, in combination with the upright grooves in the frame in which the wrists of the shaving knives are inserted, for the purpose of effecting the gradual approximation of the shaving knives in the proper taper of the shingles. 4th, The combination of the lever with its pin, the projecting cam, s, and cam, g, on the frame, for the purpose of communicating the requisite relative motion to the vibrating feed board, the driver, and frame, whereby one bolt only at a time of the two, three, or more riven by the froes, is driven outward, and forced through the shaving knives, no matter how short or thin the bolt may have been froed,

10. Magnetic Printing Telegraph; R. E. House, Binghampton, New York, formerly of the City of N. Y.; patented Dec 28, 1852; re-issued Sept. 28, 1858.

Claim—1st, The employment of force derived from an electro-magnet, to govern and regulate a force derived from the use of compressed air or other fluid, substantially in the manner specified. 2d, An electro-magnet, when made up of a series of hollow, stationary, and moving magnets, arranged so as to effect the movement of a rod or axis on which the latter are mounted. 3d, A valve, in combination with any electro-magnet to move that valve, and a piston, or its equivalent, whose motions are effected by the pressure of air or fluid, whose action is controlled by such a valve, the combination being substantially such as specified. 4th, An endless band, acting as a reservoir of coloring matter, and arranged substantially in the manner specified, in combination with paper and a series of types, and a spurred cylinder, so as to record characters when pressure is applied. 5th, In combination with a key-board at one locality, and a printing apparatus at another,

or in combination with both a key-board and a printing apparatus at each locality. I claim a detent or stop moved by the hand of the operator for arresting the motion of a type-wheel at one determined and fixed point, when there is combined therewith a key corresponding, the parts are in proper position with that determined and fixed point, the detent and key being substantially such as specified. 6th, Driving a type-wheel of a printing apparatus, by means of a friction connexion between it and a prime mover, so that the motions of the former may be modified, or its motions stopped, without causing the motion of the latter to be stopped or modified. 7th, Combining with a wheel of a printing telegraph, which must at times stop, and at other times be in motion, a spring, compressed by the action of the parts when in motion, and exerting its force to start the wheel, when released from any detent that may arrest its rotation, the combination being substantially such as to effect the purpose set forth. 8th, Causing the paper to be printed to approach the type which is to impress it, by means of a friction connexion with a prime mover, so that the latter may remain in motion while the former is at rest. 9th, The apparatus, substantially as set forth, for governing the approach of paper to a type-wheel, that at times moves and at others stops, so that the apparatus which brings up the papers shall act for that purpose when the type-wheel ceases to revolve for a longer period than usual. 10th, In combination with a type-wheel of a printing telegraph, a spurred or toothed cylinder, substantially such as is specified, the latter causing the paper to progress, as the purposes of printing by the types on the former may require—and this I also claim, in combination with another surface to press the paper upon such spurs, in the manner substantially as described.

11. Metallic Packing for Steam Pistons; Daniel Lasher, Brooklyn, New York; patented June 30, 1857; reissued September 28, 1858.

Claim—The bent or folded springs inserted between the piston and packing ring, and taking an even and extended bearing around the interior circumference of said packing ring, to cause the said packing ring or rings to take an uniform bearing on the interior of said cylinder, substantially as set forth. Also, two or more tiers of packing springs placed between the piston and the rings, as aforesaid, when the said tiers of springs are so placed as to occupy alternate positions or break joints, as set forth.

Designs.

1. Cooks' Oven Stove; Wm. W. Stevens, Westbrook, Assignor to Nathaniel P. Richardson & Co., Portland, Maine; dated September 7, 1858.
2. Stoves; Nathaniel P. Richardson & Co., Portland, Maine; dated September 7, 1858.
3. Cast Iron Bedstead; Philip Tabb, City of New York; dated September 14, 1858.
4. Nursery Bottle; Francis Kern, Sandwich, Massachusetts; dated September 14, 1858.
5. Stoves; G. Smith and H. Brown, Assignor to North, Chase & North, Philadelphia, Pennsylvania; dated September 21, 1858.

MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

Binocular Vision.

Of the thousands who gaze with delight upon the magical effects produced by that small instrument known as the stereoscope, how few there are who comprehend, or attempt to assign reasons for, the extraordinary optical illusions experienced through its instrumentality.

It is with the view of, in some degree, elucidating the principles of vision upon which these are founded, that the following article is written.

It will in the first place be well to consider the difference between monocular and binocular vision. Nature has furnished us with several means of determining the distance of objects which may happen to come within reach of our visual organs. One is that of distinctness; a greater or lesser degree of which—other things being equal—gives an idea of greater or lesser distance in the object viewed. The second is through the change of focus required in the lens of the eye in refracting to a point on the retina, rays of light entering it with a greater or lesser degree of parallelism, thus producing in the brain a consciousness of unequal distances in the objects from which they emanate.

The means above alluded to, it is evident, are enjoyed in almost the same degree when viewing with one eye as where both are used.

By far, however, the greatest power with which nature has endowed

us of discriminating distances, is through the agency of binocular vision; or in other words, in the sensation produced in the brain by the different degrees of convergency of the optic axes required in obtaining distinct vision of the differently distant points of objects upon which they are directed. It is to this faculty that we are indebted for our most palpable evidence of differential distances, and for that consciousness of solidity and relief so remarkably experienced in the stereoscope.

It is evident, for example, when we are looking at a house or other object that has depth as well as breadth, from such a point of view as to enable us to see two sides of it at once, that we receive a differently perspective image upon the retina of either eye, or that we must see more of one side and less of the other with the right eye than with the left, or vice versa. Thus accomplishing with one view what a person with but one eye would require two views at positions 2½ inches apart —the distance between the eyes—to accomplish. These are the differently perspective views of the stereoscopic cards, and it is the effort to reconcile these dissimilar pictures by converging the optic axes at points differently distant from the eyes which produces the wonderful effect above alluded to, and which enables us to experience all the sensations of delight which would be produced by the contemplation of the landscape itself.

The stereoscopic pictures will of course never quite correspond. They are taken simultaneously with a camera constructed with two lenses, or consecutively with a camera with one movable lens.

The lenses of the stereoscope, besides magnifying the pictures, are so placed as to unite certain similar points of them, thus relieving the eyes of too great effort in uniting them entirely by convergency of the axes.

The means above alluded to, by which we are enabled to judge of differential distances, are of course much diminished by the distance that the objects viewed are removed from us.

Our consciousness of different distances by distinctness is diminished through decrease of light.

Our judgment through change of focus, is diminished in consequence of the parallelism of rays from distant objects being so nearly the same as to require but little change in refracting them to a point on the retina. And lastly, the binocular effect is in a great degree impaired through the identity of distant views when seen from positions only separated by a base of 2½ inches.

Nature has thus observed her usual economy in providing for our necessities alone. It being of little comparative importance to us generally, to be acquainted with the relative positions of distant objects, whereas our personal convenience and even safety depend greatly upon our knowledge of those near at hand. We are therefore provided with much more ample means of determining the latter than the former.

It may not be out of place here to allude to another subject immediately connected with vision.

Sir David Brewster says, in allusion to the cause of erect vision from an inverted image, "That it has long been a problem among the learned." And further remarks, "That it is perfectly explained by the law of visible direction." Now, although it is evidently a consequence of that law, the question arises, why should we see objects in a direction perpendicular to the retina at the point where their image meets it?

In truth, it is one of those facts that requires no explanation, as there is nothing inconsistent or irrational in it.

There is no more reason that an inverted image should give us the idea of an inverted object, than that the reverse should be the case, or that it should give the idea of a horizontal one. There is no unity necessary between the direction of an object and the direction of its image upon the retina. Nature has so associated impressions upon the retina with impressions on the brain, that an inverted image on the former is evidence of an erect object to the latter. And we have no consciousness of anything to the contrary. W.

Germantown, Penna.

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*On the Thermo-electric Series.** By AUGUSTUS MATTHIESSEN, Ph. D.

Being enabled by the method described in the "*Philosophical Magazine*" (Feb., 1857), to obtain wires of the metals of the alkalies and alkaline earths, I have determined their places, together with those of most of the other metals, in the thermo-electric series.

If A, B, C are different metals, and (AB), (BC), (CA), the electromotive powers of thermo-elements formed out of each two of these metals, whose alternate soldering points are at two different temperatures, so is $(AB)+(BC)+(CA)=0$, and therefore

$$(AB)=a-b,$$
$$(BC)=b-c,$$
$$(CA)=c-a,$$

where the values a, b, c, not only depend on the two temperatures, but also on the nature of each of the metals A, B, C. As the differences of the same constitute the electromotive powers, the value for either of these metals may be put $=0$.

If the temperatures of the soldering points of a thermo-element only vary slightly, the electromotive powers may be said to be in ratio with the difference of the two temperatures, and under the same conditions the values a, b, and c are also in ratio with the difference of the temperatures, and their relations to each other therefore independent of the same.

If now the value of the second metal relative to the above value of the first be taken equal to 1, the values of the others, in relation to these, become constants, and only depend on the nature of each metal; these values I will call the Thermo-electric Constants. The results obtained are given in the following Table, where the thermo-electric

* From the Lond. Edin. and Dublin Philo. Mag., Sept., 1858.

constant of chemically pure silver is taken = 0, and that of a certain commercial sort of copper = 1.

Bismuth (commercial, pressed wire),	+35·81
" (pure pressed wire),	+32·91
Alloy of 32 parts of bismuth and 1 part of antimony (cast),	+29·06
Bismuth (pure, cast),	+24·96
" (crystal, axial),	+24·59
" (crystal, equatorial),	+17·17
Cobalt No. 1 (a pressed specimen prepared by Prof. Duflos, and from the Collection of the Heidelberg Chemical Laboratory),	+8·977
Potassium (the same as used for the determination of its electric conducting powers for different temperatures),	+5·492
Argentine (wire of commerce, hard),	+5 240
Nickel (commercial, free from cobalt, but containing iron, &c.).	+5·020
Cobalt No. 2 (from the Collection of the Heidelberg Chemical Laboratory),	+3·748
Palladium (wire, hard, from Desmoutis, Chapuis & Co, of Paris),	+3 560
Sodium (the same as used for the determination of its electric conducting powers for different temperatures),	+3·091
Quicksilver (pure, fused in a glass tube).	+2·524
Aluminium (from Rousseau frères of Paris, wire-drawn, analyzed by Dr. G. C. Caldwell, and found to contain Si 2·31, Fe 5·89, and Al 91·77),	+1·283
Magnesium (wire, pressed),	+1·175
Lead (pure, pressed wire),	+1·029
Tin (pure, pressed wire),	+1·000
Copper No. 1 (wire of commerce annealed, containing appreciable quantities of zinc, tin, lead, and nickel),	+1·000
Copper No. 2 (wire of commerce annealed),	+0·922
Platinum (wire from Desmoutis, Chapuis & Co., of Paris),	+0·723
Gold (wire, hard drawn, purified by Dr. C. Meyboom),	+0·613
Iridium (from the Collection of the Heidelberg Chemical Laboratory),	+0·163
Antimony (wire, pressed specimens, purified by Dr. W. P. Dexter and Dr. G. C. Caldwell),	+0·036
Silver (pure, drawn, hard),	0 000
Gas-coke (from the Heidelberg Gas Manufactory, the hard mass remaining in the retorts),	—0·057
Zinc (pure, pressed),	—0·208
Copper (galvanoplastically precipitated),	—0·244
Cadmium (a strip of foil from Prof. Böttger),	—0·332
Antimony (commercial, pressed wire),	—1·897
Strontium (pressed wire),	—2·028
Lithium (pressed wire),	—3 763
Arsenic (a piece, pure),	—3 828
Calcium (pressed wire),	—4·260
Iron (piano-forte wire No. 4),	—5·218
Antimony (axial),	—6·965
" (equatorial),	— 9·435
Red phosphorus (from Prof. Schrötter, from the Collection of the Heidelberg Chemical Laboratory),	—9·600
Antimony (purified as above),	—9·871
An alloy of 12 parts of bismuth and 1 part of tin,	—13·670
" 2 " antimony and 1 part of zinc,	—22·700
Tellurium (from M Alexander Loewe, purified by M. Holtzmann),	—179·80
Selenium (from the Collection of the Heidelberg Chemical Laboratory),	—290·00

The method by which these determinations were made is the following:—Two thermo-elements, whose warm and cold soldering points had the same temperatures, were compared with each other; these formed a circuit with the coil of a multiplicator, which surrounded a magnet rod (of about a pound weight), to which was fastened a piece of looking-glass, thereby allowing the deflexions of the magnet to be

observed at a distance by means of a telescope and scale, in the same manner as observations are made with the magnetometer. Two commutators were also brought into the circuit; the one changed the direction of the current in the wire of the multiplicator, the other allowed the currents of the thermo-elements to pass either so as to strengthen, or so as to oppose each other.

The foregoing experiments were carried out in the Physical Cabinet at Heidelberg, under the direction of Prof. Kirchhoff, to whose advice and assistance I am much indebted.

Solar Eclipse of March, 1858.

M. Quetelet at Brussels, carefully observed two compensating pendulums, in comparison with a chronometer, during the eclipse. The object was to see whether their vibrations were slower, as Professor Zantedeschi thought would be the case. The two pendulums were arranged so as to vibrate, the one parallel, the other perpendicular to the meridian. The one parallel to the meridian showed no change, but the other showed a loss of more than a second and a quarter per hour during the eclipse. The record of observations made several times a day for several days, both before and after the eclipse, show that this was no accidental coincidence; but many more observations will be necessary to establish the connexion of effect and cause between it and the eclipse.

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*On the Fixation of Metallic Sulphurets in Cotton-printing.** By Dr. H. Sacc.

The number of metallic colors employed in calico printing is so small, that there is sufficient inducement to seek for new ones, as fashion daily requires patterns of more varied colors and more effect in the coloration.

Hydrated oxide of iron, manganese bistre, oxide of chrome, chromate of lead, ultramarine-blue and green, Schweinfurt-green, copper-iron green, and the sulphurets of arsenic and antimony are probably all the mineral dyes which are employed in calico printing. Their use is, however, very limited, because some of them are difficult of fixation and others furnish unattractive tints; for this reason the reddish yellow, the sea-green from oxide of chrome, and the colors fixed by white of egg are almost the only ones of the above-mentioned group which are still employed. From the circumstance that these colors are fixed with difficulty, the following experiments were made, with the view of fixing metallic colors upon calicoes by means of a current of steam.

Numerous attempts to fix solid, colored metallic sulphurets of characteristic and fine tints upon the fibre proved failures; but satisfactory results were obtained by preparing the hyposulphites of those heavy metals whose sulphurets are not attacked by the weaker acids, such

* From the London Chemical Gazette, No. 381.

as cadmium, nickel, copper, lead, and mercury. Sulphuret of bismuth, protosulphuret and persulphuret of tin, and sulphuret of antimony were not adapted for this process, because the soluble salts of these metals are decomposed immediately when they are brought into contact with an alkaline hyposulphite, and thrown down in the form of perfectly insoluble sulphurets.

It is necessary that the metallic sulphuret should be formed upon the stuff itself, so that it must be employed in the form of a hyposulphite either in solution, or at least suspended; consequently, if the mixtures have been standing too long they become useless, because the metallic sulphuret is then already formed. After many trials the following proportions of the metallic salt and hyposulphite of soda proved to be the best.

It is to be noted preliminarily that the solution of gum contains 1 kilogrm. of gum in the litre of water, and the solution of hyposulphite of soda, 200 grms. of the solid salt in the litre.

Cadmium-yellow.—¼ litre of solution of gum is heated with 40 grms. of perchloride of cadmium, and ¼ litre of solution of hyposulphite of soda is added to the solution; the mixture is printed, steamed, and washed. It furnishes a very beautiful, solid, but unfortunately rather expensive yellow, which is but little changed even in the madder-bath.

Copper-green.—¼ litre of solution of gum is mixed with 25 grms. of sulphate of copper; the latter is dissolved by the aid of heat, and then ¼ litre of hyposulphite of soda is added. This green is very fine, and may be put into the madder-bath without undergoing any alteration; it is very uniform (when printed on a white ground it is better thickened with leicome than with gum), but it has the disadvantage, that when printed in warm weather it soon fades.

Nickel-gray.—¼ litre of solution of gum, 25 grms. of protochloride of nickel, and ¼ litre of hyposulphite of soda.

Lead-gray.—¼ litre of solution of gum, 25 grms. of nitrate or 50 grms. of acetate of lead, and ¼ litre of hyposulphite of soda. This gray may also be placed in the madder-bath without injury; the nickel gray acquires a somewhat lilac color by this treatment.

Mercury-gray.—¼ litre of solution of gum, 10 grms. of perchloride of mercury, and ¼ litre of hyposulphite of soda; or, to form chlorosulphuret of mercury, 50 grms. of perchloride of mercury instead of 10 grms.

These latter colors are very solid, but not easily prepared. The experiments will be further continued.—*Schweizer, Polytechn. Zeitschrift*, 1857, Bd. II. p. 175.

Photography on Iron.

M. Van Monchaven introduces with the collodion a proto-salt of iron, which forms in the silver bath a reducing agent, which, by its slow decomposition, gives peculiar rapidity to the process. The plates are very thin; they are simply sheets of Swedish iron varnished by heat with a bituminous mixture. The idea appears to be American, but the merit resides in the perfection of the work.—*Cosmos.*

For the Journal of the Franklin Institute.

Particulars of the Steamboat Serehil.

Hull and machinery built by Boardman, Holbrook & Co. Owners, Louisiana Tehuantific Co.

Hull.—			
Length on deck,		140 feet.	
Breadth of beam (molded),		34 "	6 inches.
Depth of hold,		5 "	6 "
Draft of water,		2 "	
Tonnage,	245.		
Speed in knots,	12.		
Masts,—one.			
Engines —Inclined direct.			
Diameter of cylinders, two,			18 inches.
Length of stroke,		6 feet.	
Maximum pressure of steam in pounds,	75.		
Boilers.—Two—Horizontal tubular.			
Length of boilers,		20 feet	$4\frac{1}{2}$ inches.
Breadth "		5 "	
Height " exclusive of steam chimney,		7 "	
Weight of " without water,	32,000 lbs.		
Number of furnaces,—one.			
Breadth "		4 "	4 "
Length of grate bars,		5 "	
Number of tubes,	122.		
Internal diameter of tubes,			$2\frac{3}{4}$ "
Length of tubes,		15 "	
Diameter of smoke pipe,		2 "	6 "
Height "		24 "	
Draft,—natural.			
Consumption of coal per diem,	8 tons.		
Paddle Wheels.—			
Diameter, over boards,		18 feet.	
Length of blades,		5 "	
Depth "			14 inches.
Number "	18.		

Remarks.—Frames, sketch of shape,]. Depth, 3 inches. Width of web, $\frac{5}{8}$ in. Thickness of plates, $\frac{3}{8}$ to $\frac{3}{16}$-inch. Diameter of rivets $\frac{3}{4}$-in.; distance apart, $2\frac{1}{2}$ inches; single riveted. One independent steam, fire, and bilge pump. Three bulkheads. Water bottom to boilers. One longitudinal bulkhead for entire length and breadth. C. H. H.

Protection of Plants from Frost.

M. Boussingault has devoted a long article in the *Annales de Chimie et de Physique* to the preservation of plants from frost, by filling the air with smoke. This is not recommended on nights when the thermometer at a distance above the soil indicates a temperature below 32°, for it would then have no effect; nor on windy nights, for then there is no frost; but it may possibly be found of service in protecting fruit-trees and delicate plants from the late frosts of spring, by which their blossoms are so often destroyed. Is it not, at any rate, worth trying?

*Poison in Paper-Hangings Colored with Arsenite of Copper.**

By G. Phillips.

In the "*Pharmaceutical Journal*" for February last, it is stated that Dr. Halley, of Harley street, had detected arsenious acid in the atmosphere of his study, the walls of which were covered with green paper, and that the test he employed was "sheets of paper soaked in a solution of ammonia-nitrate of silver," and that upon this paper were deposited numerous well defined crystals of arsenious acid, visible under a low power with the microscope, and that the form of these crystals precluded the possibility of a mistake.

Ammonia-nitrate of silver is a test for arsenious acid, but not in the manner which Dr. Halley seems to suppose, as it does not cause the deposition of crystals of arsenious acid (which are colorless), but produces a bright yellow precipitate of arsenite of silver, provided the amount of ammonia present in the test be very exactly proportioned to that of the nitrate of silver; if such be not the case, no precipitate is produced. These particulars are mentioned because Dr. Halley appears not to have resorted to any other test, but to have concluded merely from the appearance of the crystals formed on his test paper, and without analyzing them, that they must be those of the poison in question.

In the following experiments, made with a view to test Dr. Halley's conclusions, the interior surfaces of two closets were covered with a green paper-hanging. One of the closets had a capacity of 17 cubic feet, and was lined with about 48 square feet of the paper, or 2·8 sq. feet to each cubic foot of space. The other closet had a capacity of 26 cubic feet, and was lined with 53 square feet of paper, or 2·0 square feet to each cubic foot of space.

These closets had no means of ventilation beyond the chinks round the doors; the included air, therefore, would remain much longer in contact with the paper than would be the case in an ordinary room. The surface of the paper to the bulk of air inclosed was not less than 14 times as great as it would be in a room 20 feet square and 12 feet high, thus showing that the conditions of the experiments were highly favorable to the impregnation of the air with arsenious acid, if such were possible. In each of these closets were placed two basins, one containing a solution of potash, the other ammonia-nitrate of silver, and a sheet of paper saturated with the latter re-agent. The smaller closet was kept as much as possible from the influence of common gas; but in the larger closet gas was allowed to burn during the day time, the temperature of the included air being kept by the flame at from 74° to 82° Fahr. The closets were carefully closed for 72 hours, the gas burning during that time 45 hours in the larger closet. The solutions of potash and ammonia-nitrate of silver from each closet were then examined by Marsh's test, which is by far the most delicate known, and found to be quite free from arsenic.

* From the Lond. Civ. Eng. and Arch. Journ., Aug., 1858.

The sheets of paper saturated with ammonia-nitrate of silver were also free from arsenic, but had on their surface numerous colorless crystals, which, when analyzed, proved to be nitrate of silver, the evaporation of the water from the test paper having concentrated the solution with which the paper was saturated to such an extent as to cause the nitrate of silver to crystallize out. On the test paper was also found an amorphous substance having a dingy yellow color, which speedily became black on exposure to light; the same substance was also observed on the surface of the ammonia-nitrate of silver contained in the basins, being most abundant in that which had remained in the closet in which gas had been burnt. When analyzed it was found to be sulphide of silver, the sulphur no doubt having been derived from the atmosphere of the laboratory, which always contains traces of sulphureted hydrogen. This dingy yellow substance, which, without analysis, might be supposed by some to be arsenite of silver, was formed in a third closet in which no arsenical compounds were present, thus proving that the green paper had no share in its production.

The green paper used in the experiments is colored with what is known as emerald or Schweinfurt green, which is a compound of arsenite of copper and acetate of copper. The paper contains 11·8 grains of arsenious acid to the square foot.

The following conclusions may fairly be drawn from the experiments above described:—

1. That even when a small bulk of air is allowed to remain, for a considerable time, in contact with a large surface of the arsenical paper, and that too at a temperature of 80° Fahr. not the slightest trace of arsenious acid is diffused in the air. Still less might the air of an ordinary room which occupies a large space in proportion to the surface of the walls, and which is being constantly changed by ventilation, be expected to become contaminated by the poison.
2. That the products of the combustion of gas do not facilitate the liberation of arsenious acid from the surface of the green paper.
3. That arsenious acid is not volatilized from the surface of such paper except at temperatures too high for human endurance.

It is probable that persons may have been affected by inhabiting rooms papered with arsenical hangings, not because the arsenious acid has been volatilized, but from the improper and frequent sweeping of the walls, by which minute particles of arsenite of copper might be detached from those portions of the surface of the paper which were not glazed, and becoming dispersed in the air, might be inhaled by persons occupying the room at the time. This only source of danger, which might be obviated by a little management in the cleaning of a room, and caution in the selection of a paper having but little of its surface unglazed, appears not to have presented itself to the mind of Dr. Halley, who seems to have been possessed with the idea that injury to health was to be apprehended solely from the vaporization of the arsenious acid. Dr. Taylor, on the other hand, ascribes the dan-

ger to the fact that the color is "put on very loosely," and, therefore, by inference, easily detached and disseminated through the air, not as vapor of arsenious acid, but as minute particles of arsenite of copper.

The subject under consideration being one of much importance, I have felt it neccessery to enlarge upon it, and as Dr. Halley's statement is calculated to create an apprehension of danger which I believe has no existence, I beg to make the following remarks:

Dr. Halley states that on two occasions distinct crystals of arsenious acid were deposited on the surface of his test paper from the air of his room; it is more than probable that if he had analyzed the crystals, and not assumed their composition from their appearance under the microscope, he would have found them to be nitrate of silver. The test paper which he used had no more effect in causing the deposition of crystals of arsenious acid than any other surface in the room would have, and to suppose that crystals of the poison were thus deposited would be to imply that the air was impregnated with arsenious acid to an extent which must be fatal to persons inhaling it for a short time. Notwithstanding his statement that the air of his room furnished crystals of arsenious acid, he subsequently says that at ordinary temperatures with common atmospheric air, even when an aspirator was used, the amount of arsenic given off was "inappreciably small," omitting to mention what test he employed to detect a quantity not appreciable. The purport of his remarks, however, appears to be that arsenious acid to an appreciable extent, is only given off from arsenical paper in rooms in which gas is burnt, and that the products of the combustion of the gas *combine* with the arsenic in the paper. If such be the case, it is difficult to conceive how the arsenious acid can be deposited from the air of the room in a *free* and crystalline state.

It may be proper to mention that I and my family occupied a sitting-room three years, the walls of which were covered with paper heavily laden with arsenite of copper, and that for the same period my bed-room was also papered with arsenical hangings, yet neither I nor any member of my family experienced the slightest ill effect from such paper.

In conclusion, I beg to express my opinion that no danger need be apprehended from such papers, in which but a small proportion of the surface is unglazed, provided ordinary care be used when removing the dust from the walls, and that even if such care were not exercised it is doubtful whether any pernicious effects would be felt by those inhabiting the room.

Unwholesomeness of Lights.

Recent experiments have proved that lights of equal intensity obtained from different materials, require very different lengths of time to generate the same quantity of carbonic acid. The following is the relative time required by the common materials: Olive oil, 72 minutes; Russian tallow, 75; common (French) tallow, 76; whale oil, 76; stearic

acid, 77; wax candles, 79; spermaceti, 83; gas from common coal, 98; gas from fat or cannel coal, 152 minutes. Coal gas, therefore, and especially gas from cannel coal, is the least unhealthy of all ordinary lights; which is contrary to the usual opinion.—*Cosmos, June*, 1858.

[Here, there is no opinion unfavorable to gas on account of unhealthiness, because uncommon care is taken in this city to have it thoroughly purified; but in Paris, the popular opinion is right, for there the gas contains so much sulphur in various combinations as to be decidedly both unhealthy and offensive when burned in rooms. The above experiments, which teach only the quantity of carbonic acid generated, in no way contradict the common opinion there formed. Ed. *Fr. Jour.*]

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*Improvement in Producing Gas.**

M. J. Alphonse, miner, and F. Canal, Paris, have obtained "provisional protection" for an invention which consists in the use of tar and other residues arising from the manufacture of gas and other tars, resinous, or fatty matters, mixed with thin shavings, or chips, or pieces of wood, and saw-dust of all kinds of wood. This mixture is distilled in ordinary gas apparatus, and the gas resulting purified by ordinary means. By this process a very pure and cheap gas is obtained of good lighting power. The proportions of the various substances employed, are as follows:—

500 parts of the residue of gas or of fatty matter.
1000 parts of saw-dust of any kind of wood.
500 parts of shavings, chips, or pieces of wood of any kind.

In the various experiments it has been found these proportions are very suitable, but these can be varied according to the nature of the residue, or resinous, or fatty matter, according to the saw-dust and chips at the manufacturer's disposal, and also according to the quality of gas to be produced.

Note on the Measurement of Gases in Analysis.† By A. W. Williamson, Ph. D., F.R.S., Prof. of Chemistry in University College, and W. J. Russell, Ph. D.

In Bunsen's admirable method of gas analysis, considerable time and trouble are expended in observing the exact temperature and pressure to which the gas is subjected at the time of measurement; and also in calculating from these data the volume which the gas would occupy at the normal temperature and pressure. Frankland's excellent apparatus, on the other hand, protects the gas from the influence of variations of atmospheric pressure, and, under favorable conditions, even from the influence of change of temperature; but the complication of this apparatus, and its liability to derangement, seem likely somewhat to limit its use.

* From the London Mining Journal, No. 1194.
† From the London Chemical Gazette, No. 377.

If, when a fall of temperature takes place, we could diminish the pressure on the gas exactly in proportion to the diminution of elasticity which it undergoes, such fall of temperature would evidently not alter the volume of gas in the eudiometer. In like manner a rise of temperature might, if known, be counteracted by lowering the eudiometer-tube. The same remarks apply to variations of barometric pressure; as an increase of this influence might be counterbalanced by raising the eudiometer, and a diminution by depressing it.

It is therefore a question of some interest to find, for any atmospheric temperature and pressure, at what height of the eudiometer the enclosed gas will occupy the same volume as at the normal temperature and pressure. This is easily found by introducing a standard quantity of air into a tube over mercury, marking off the height of the mercury in the tube at the normal temperature and pressure; then, at any other temperature or pressure, raising or lowering the tube in the mercurial trough so as exactly to bring the enclosed air to its normal volume. The mercurial pressure needed for this purpose is evidently the same as that needed under the same circumstances for the reduction of any quantity of gas to the volume which it would occupy at the normal temperature and pressure.

The apparatus we use in applying this principle to gas analysis consists essentially of the ordinary Bunsen's eudiometer, and a "pressure tube," which is simply a tube of some 6 or 7 inches in length and about the diameter of an ordinary eudiometer. It is closed at one end, and to the other is fixed a smaller tube of about the same length. Such a quantity of air is introduced into this pressure-tube, that when it is inverted in the trough the mercury stands at a convenient height in the narrow tube. At this point a mark is made, which indicates the height of mercury needed at any temperature or pressure to reduce the enclosd air to its original volume. The mercurial trough which we have used differs only from the ordinary one in being provided with a well at one end, thus enabling the operator to raise or depress the eudiometer at pleasure, so as always to bring the gas which it contains to the same pressure as the air in the pressure-tube. Both the eudiometer and the pressure-tube are held in a perpendicular position by means of clamps which slide on upright rods. Each clamp is provided with a simple kind of slow movement, by which the tube can be raised or lowered by the operator whilst he is looking through a horizontal telescope at a suitable distance. We place the pressure-tube in front of the eudiometer, and by means of the fine adjustment bring the column of mercury in the small tube exactly to the normal mark. The eudiometer is then adjusted, also by means of the slow movement, so that the top of its meniscus (as seen through the horizontal telescope) exactly coincides with the top of the meniscus in the pressure-tube. This is easily done; for the diameter of the pressure-tube is considerably smaller than that of the eudiometer, and the meniscus in the latter can be clearly seen on both sides of the meniscus in the pressure-tube.

By this method we are able to obtain very accurate results with considerably less trouble than by Bunsen's method, and also without having

any calculations to perform. The following analysis made during very stormy weather, of air deprived of its carbonic acid by potash, gave results amongst which the greatest difference was only four hundredths of a ℘ cent. (·04).

I.

Volume of air taken,		144·81
After addition of hydrogen,		234·50
After explosion,		144·00
Nitrogen,	79·168	
Oxygen,	20·832	
	100·000	

II.

Volume of air taken,		139·55
After addition of hydrogen,		229·07
After explosion,		141·89
Nitrogen,	79·176	
Oxygen,	20 824	
	100·000	

III.

Volume of air taken,		148·1
After addition of hydrogen,		236·04
After explosion,		143·30
Nitrogen,	79·139	
Oxygen,	20·861	
	100·000	

IV.

Volume of air taken,		149·14
After addition of hydrogen,		248·57
After explosion,		155·28
Nitrogen,	79·150	
Oxygen,	20·850	
	100·000	

We are still engaged in experiments on this and some other points of gas analysis, and hope to have the honor of communicating our results before long.

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*Professor Forbes on some Properties of Ice near its Melting Point.**

Prof. Forbes has communicated to the Royal Society of Edinburgh the results of some experiments made by him on the properties of ice near its melting point, with particular reference to those of Mr. Faraday, published in the *Athenæum* for June 1850, to which attention has been more lately called by Dr. Tyndall and Mr. Huxley in relation to the phenomena of glaciers. The substance of Prof. Forbes' statement is as follows:—

"Mr. Faraday's chief fact, to which the term 'regelation' has been more lately applied, is this, that pieces of ice, in a medium above 32°, when closely applied, freeze together, and flannel adheres apparently by congelation to ice under the same circumstances.

* From the Lond. Athenæum, Aug., 1858.

"1. These observations I have confirmed. But I have also found that metals become frozen to ice when they are surrounded by it, or when they are otherwise prevented from transmitting heat too abundantly. Thus a pile of shillings being laid on a piece of ice in a warm room, the lowest shilling, after becoming sunk in the ice, was found firmly attached to it.

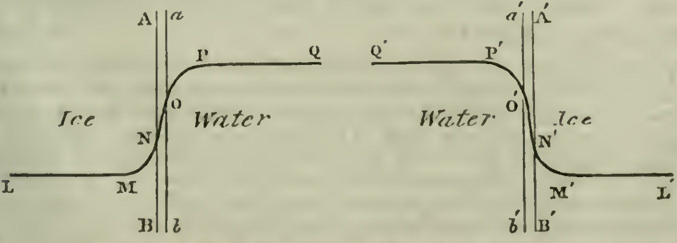
"2. Mere *contact*, without *pressure*, is sufficient to produce these effects. Two slabs of ice, having their corresponding surfaces ground tolerably flat, were suspended in an inhabited room upon a horizontal glass rod passing through two holes in the plates of ice, so that the plane of the plates was vertical. Contact of the even surfaces was obtained by means of two very weak pieces of watch-spring. In an hour and a half the cohesion was so complete, that, when violently broken in pieces, many portions of the plates (which had each a surface of 20 or more square inches) continued united. In fact, it appeared as complete as in another experiment where similar surfaces were pressed together by weights. I conclude that the effect of pressure in assisting 'regelation' is principally or solely due to the larger surfaces of contact obtained by the moulding of the surfaces to one another.

"3. Masses of strong ice, which had already for a long time been floating in unfrozen water-casks, or kept for days in a thawing state, being rapidly pounded, showed a temperature of 0·3° Fahr. below the true freezing point, shown by delicate thermometers (both of mercury and alcohol), carefully tested by long immersion in a considerable mass of pounded ice or snow in a thawing state.

"4. Water being carefully frozen into a cylinder several inches long, with the bulb of a thermometer in its axis, and the cylinder being then gradually thawed, or allowed to lie for a considerable time in pounded ice at a thawing temperature, showed also a temperature decidedly inferior to 32°, not less, I think, than 0·35° Fahr.

"I think that the preceding results are all explicable on the one admission, that Person's view of the gradual liquefaction of ice is correct (*Comptes Rendus*, 1850, Vol. xxx. p. 526)*, or that ice gradually absorbs latent heat from a point very sensibly lower than the zero of the centigrade scale.

"I. This explains the permanent lower temperature of the interior of ice.



"Let A B be the surface of a block of ice contained in water at what is called a freezing temperature. That temperature is marked by the

*Quoted by me in 1851, in my sixteenth letter on Glaciers.

level of the line Q P above some arbitrary zero. L M is, in like manner, the permanent but somewhat lower temperature possessed by the interior of the ice. The space, partly water, partly ice, or partaking of the nature of each, M N O P, has a temperature which varies from point to point, the portion N O corresponding to what may be called the physical surface of the ice between A B and *a b*, which is 'plastic ice,' or 'viscid water,' having the most rapid variation of local temperature.

"II. Such a state of temperature, though it is in one sense permanent, is so by compensation of effects. Bodies of different temperatures cannot continue so without interaction. The water *must* give off heat to the ice, but it spends it in an insignificant thaw at the surface, *which therefore wastes even though the water be what is called ice cold*, or having the temperature of a body of water inclosed in a cavity of ice.*

"The waste has yet to be proved; but I have little doubt of it; and it is confirmed by the wasting action of superficial streams on the ice of glaciers, though other circumstances may also contribute to this effect.

"III. The theory explains 'regelation.' For let the second plane surface of ice A′ B′ be brought up to nearly physical contact with the first surface A B. There is a double film of 'viscid water' isolated between two ice surfaces colder than itself. The former equilibrium is now destroyed. The films A B *b a* and A′ B′ *b′ a′* were kept in a liquid or semi-liquid state by the heat communicated to them by the perfect water beyond. That is now removed, and the film in question has ice colder than itself on both sides. Part of the sensible heat it possesses is given to the neighboring strata which have less heat than itself, and the intercepted film of water in the transition state becomes more or less perfect ice.

"Even if the second surface be not of ice, provided it be a bad conductor, the effect is practically the same. For the film of water is robbed of its heat on one hand by the colder ice, and the other badly-conducting surface cannot afford warmth enough to keep the water liquid.

"This effect is well seen by the instant freezing of a piece of ice to a worsted glove even when on a warm hand. But metals may act so, provided they are prevented from conveying heat by surrounding them with ice. Thus, as has been shown, metals adhere to melting ice.

"*Edinburgh, April* 19." J. D. F."

* "I incline to think that water, in these circumstances, may, though surrounded by ice, have a fixed temperature somewhat higher than what is called 32°. But I have not yet had an opportunity of verifying the conjecture.—[My idea is, that the invasion of cold from the surrounding ice is spent in producing a very gradual 'regelation' in the water which touches the ice, leaving the interior water in possession of its full dose of latent heat, and also of a temperature which may slightly exceed 32°. By similar reasoning, a small body of ice, inclosed in a large mass of water, will preserve its proper internal temperature *below* 32°; but, instead of regelation taking place, the surface is being gradually thawed. This is the case contemplated in the paragraph of the text to which this note refers.]"

N. B.—The words in brackets were added to this note during printing. 13th May, 1858. J. D. F.

Telescopic Mirrors.

M. Leon Foucault appears to have introduced a very great improvement in the art of making mirrors for telescopes, by constructing them of glass in place of metal. He finds that a true parabolic figure may be easily and rapidly given, and the much greater stiffness and elasticity of the glass prevents the deformation of the mirror when the plane of the opening is vertical. The reflecting surface is of silver deposited on the glass galvanically—and no better idea can be given of the excellence both of the figure and polish, than by repeating his statement that by means of a mirror thus made of 33 centim. (13 inches) opening, and 2·25 metres (7·38 feet) focal length, he was enabled to see the star γ Andromedæ triple, which no refractor less perfect than the great Pulkova instrument is able to show.—*Cosmos, August* 6, 1858.

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*Waterglass, as a Preservative of Materials.**

We are anxious from time to time to lay before our readers somewhat *in extenso* the particulars of such aids to art productions and their preservation as it may fall to our lot to investigate; believing, that though the means of conducting certain inquiries may not be altogether perfect, and thus we may occasionally arrive at overstrained conclusions, we are advancing rather than retarding the interests of practical science when we adduce, to the best of our ability, such materials for further experiments as circumstances may enable us to glean.

A few months since a considerable space was devoted in our *Journal* in exemplifying the process employed by Mr. Poole in endeavoring, by certain chemical means ingeniously applied, to arrest the progress of decay in the monumental remains in Westminster Abbey; we now purpose to treat of another preparation, largely used on the Continent, for which various and important qualities are claimed, and the correctness of which it is desirable to ascertain; that if confirmed, so valuable a medium should secure its speedy recognition far and wide.

Waterglass is a preparation in which silica is a large ingredient, the composition resembling that of ordinary glass, only that it is soluble in water. The various properties it contains (under different modifications) may be stated as follows: A solution of Waterglass, painted on any substance which is not too porous, dries very rapidly, and forms a shining varnish, possessing great durability, more particularly when it has been mixed with certain pulverized substances, colors, &c.; these paints will undergo no change either of atmospheric influence, moisture, weak acid, or by the action of fire. Experiments, with the view of testing these last qualities, were lately made at Chatham,—under the direction of Lord Panmure,—on large huts, painted inside and out with Waterglass in combination with lime wash, which satisfactorily retarded the effects of fire and moisture.

Waterglass applied to porous substances, as stone, wood, &c., pene-

* From the London Civ. Eng. and Arch Jour., September, 1858.

trates partially into the pores, and forms a chemical combination with them.

The silica, as a component, has the property of combining with lime and similar substances, and of forming with the mortar or stone a hard cementing power. The formation of the new and insoluble silicate will be accelerated in proportion to the atmospheric air admitted, the carbonic acid of the atmosphere having a beneficial influence. In proof of this it appears that a piece of common chalk, immersed for a time in this solution, and afterwards dried, will become as hard as stone; whence it is inferred that a mixture of finely powdered chalk with Waterglass will form a cement of unusual hardness.

This medium is prepared in four degrees of strength, according to the several requirements for its application, viz: from a weak solution, which is most generally useful, to a thick syrupy consistence, which is principally useful as a cementing agent. For the hardening of stone or cement, and preserving them from damp and decay, the thin mixture is applied to the surface several times, allowing a sufficient interval between each application for drying (about half an hour suffices for this), and the coatings should be continued till the liquid is no longer absorbed by the stone, &c., and a good surface is acquired. It is recommended that the applications of simple solution and paints be not laid on too thick, frequent and thin coats being better, although it is desirable that not too many coatings should be given, so as to produce a glassy surface, since this might interfere with its durability. A good ground material for working on, when stone is not used, is mortar composed of lime and sand. This is particularly important for artistic works, and the new method of fresco painting known as Stereochromy.

Wood, coated with a solution of Waterglass, assumes a darker shade, somewhat similar to the effect of nitric acid on it,—the fluid penetrating the pores, and forming on the surface a glassy impermeable coating calculated to resist the influence of fire, air, and damp. Other substances, more or less inflammable, may thus it is presumed be protected from fire. Paper-hangings particularly, which can also be washed with soap without injury, decorations for theatres, &c., linen, cloth, &c., may, it is asserted, be rendered thus fire-proof, while it is also a useful agent in protecting wood from moisture, fungus, and dry rot. The following is the process adopted. The timber is first slightly damped, and then put into a solution of green vitriol; and, when well saturated, immersed in a weak dilution of Waterglass. By this mode of treatment wood is almost silicated, and its durability greatly enhanced.

The introduction of Waterglass for calico printing, by Mr. Kuhlman, is an important item in its varied uses. This gentleman has compiled several interesting papers on it, which Messrs. Sicherer and Hausman intend to communicate at some future time.

It remains to direct such of our readers as are interested in the subject, but are not acquainted with the depot, to the "Metropolitan Waterglass Works," 17, Eastcheap, London; where more detailed information will be imparted than we have been able here to communicate.

*Lighting from Ceilings.**

A Venetian has invented a new apparatus for lighting theatres. By parabolic mirrors he concentrates the light over the opening in the ceiling, and they are reflected down on a system of plano-concave lenses, a foot in diameter, which occupy the aperture, and convey into the theatre the rays of light, which arrive at them parallel and depart from them divergent. It is said to be efficacious and very cheap, lighting the whole theatre. The system of lighting, exclusively from above, by reflectors, and in connexion with ventilation, has been extensively practised in churches, halls, and other public buildings throughout our own country, under the name of "sun-lights."

Photographic Enamels.

MM. Armengaud in the *Genie Industriel* announce that "the MM. Bruder, of Neufchatel, (Switzerland,) have discovered a process by which photographs may be developed on white enamel, incorporated by vitrification, and covered with a glaze of glass also melted and incorporated with the enamel. They apply the same process also upon metals and wood." M. l'Abbe Moigno, in the *Cosmos*, claims this invention for M. Lafont de Camarsac, and affirms that medallions, broaches, &c., ornamented in this way, may be found at the store of M. *Disderi, Boulevard des Italiens, No.* 8.

On the Rotation of a Metallic Sphere by Electricity.†

At a recent meeting of the Royal Society an ingenious and curious apparatus was exhibited, displaying the rotation of a metallic sphere by electricity. The apparatus was contrived by Mr. Gore, of Birmingham, who states that his experiments had their origin in a phenomenon observed by Mr. Fearn, of Birmingham, in his electro-gilding establishment—that a tube of brass half an inch in diameter and 4 feet long, placed upon two horizontal and parallel brass tubes, 1 inch in diameter, and 9 feet long, and at right angles to them, and the latter connected with a strong voltaic battery consisting of from 2 to 20 pairs of large zinc and carbon elements, the transverse tube immediately began to vibrate, and, finally, to roll upon the others. Acting upon this, Mr. Gore constructed a disk of wood provided with two brass rails, level, uniform, and equidistant; on these rails a hollow and very thin copper ball was placed, and the brass rails being connected with a zinc and carbon battery, the ball began to vibrate, and presently to revolve. In all cases yet observed, Mr. Gore states that the motion of the ball is attended by a peculiar cracking sound at the points of contact, and by heating of the rolling metal. When the apparatus was exhibited before the Royal Society, electric sparks were seen as the ball rolled from the spectator.

* From the Lond. Civ. Eng. and Arch. Journal, Oct., 1858. † From the Lond. Athenæum, July, 1858.

Abstract of Meteorological Observations for September, 1858; *made in Philadelphia, Somerset, Bedford, and Huntingdon Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.*

PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.

September, 1858.	Barometer. Mean.	Barometer. Mean daily range.	Thermometer. Mean.	Thermometer. Daily oscillation.	Thermometer. Mean daily range.	Relative humidity. 2 P. M.	Force of vapor. 2 P. M.	Rain.	Prevail'g winds.
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	
1	29·864	·075	73·5	20	0·7	51	·522		S W.
2	29·806	·058	74·7	15½	2·2	52	·571		(var.)
3	29·708	·098	79·8	19	5 2	61	·761	0·061	S.
4	29·687	·039	75·0	18	6·8	60	·676	0·467	N W.
5	29·775	·088	71·7	21	6·0	55	·584		S W.
6	29·897	·122	73·7	18	2·0	45	·472		S.
● 7	30·071	·141	75·0	23	1·3	41	·492		S W.
8	30·014	·023	73·3	21	1·7	46	·519		S W.
9	29·998	·080	76·8	23	3·5	52	·662		S W.
10	29·875	·090	78·0	21	1·2	52	·662		S W.
11	29·792	·083	73·0	10½	8·3	81	·679	0·222	(var.)
12	29·827	·039	70·0	15	·5·0	42	·388		W N W
13	30·025	·198	65·7	19	4 3	47	·395		N E.
14	30 061	·067	66·7	17	1·7	50	·408		E.
☾ 15	29·812	·269	70·3	10½	3·7	76	·641	0·030	N E.
16	29·403	·389	68·3	14	2·0	63	·531	0 696	N W.
17	29·846	·443	63·7	16	4·7	49	·370		W.
18	30·169	·323	63·7	21	1·3	34	·265		W N W
19	30·192	·024	68·0	22½	4·3	46	·442		N W.
20	30·141	·059	69·7	23	1·3	48	·509		S W.
21	29·839	·302	74·7	26	5·2	55	·676		S W.
○ 22	29·870	·135	60 0	25	14·8	38	·260		N W.
23	29·997	·127	53·5	22	7·8	36	·201		N W.
24	29·906	·096	56·5	13	5·0	76	·380	0·113	S W.
25	30·069	·163	56 3	17½	4·2	39	·243		N E.
26	30·146	·078	56·8	24	2·8	37	·244		N E.
27	30·157	·025	59·5	24	2·7	35	·246		N E.
28	30·053	·104	58·8	21	1·0	38	·260		N E.
☽ 29	29·882	·171	61 7	26	2·8	42	·344		(var.)
30	29·752	·130	69·3	26	7·7	52	·546		S W.
Means	29·992	·135	67·9	19·7	4·1	50	·465	1·589	s 88½ w

SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.

September, 1858.	Bar. Mean.	Ther. Mean.	Relative humidity. 2 P. M.	Force of vapor. 2 P. M.	Rain.	Prevail'g winds
	Inch.	°	Per ct.	Inch.	Inch.	
1	27·677	65·0	49	·456		W.
2	27·629	66·3	49	·456		S W.
3	27·548	70·0	69	·638	0·045	(var.)
4	27·543	65·0	63	·455	0·247	W.
5	27·628	61·3	55	·429		W.
6	27·810	63·0	60	·540		(var.)
7	27·863	69·3	39	·409		S.
8	27·832	70·7	43	482		S.
9	27·761	74·3	54	·648		S.
10	27 659	73·0	55	·656	0·183	S W.
11	27·622	63·0	51	·428	0·055	W.
12	27·683	57·7	41	·273		W N W
13	27·794	57·7	49	·370		S E.
14	27·794	61·7	54	·442		(var.)
15	27·584	58·3	89	·510		S E
16	27·334	56·3	94	469	0·665	W N W
17	27·735	53·7	65	·338		W.
18	27·963	55·7	56	·397		W S W.
19	27·987	63·0	53	·513		W.
20	27·960	65·7	60	·676		(var.)
21	27·744	69 7	50	·516		(var.)
22	27·737	52·7	61	·288		N N W.
23	27·806	49·3	57	·327		N W.
24	27·655	55 7	76	·364	0·149	(var.)
25	27 819	52·0	67	·282		E.
26	27·876	56·0	48	·284		(var.)
27	27·937	53·0	40	·258		E.
28	27·828	55·7	48	·353		S W.
29	27·662	59·7	52	·469		W S W.
30	27·576	70·7	52	·571		W S W.
Means	27·735	61 5	57	·413	1·344	

BEDFORD, Bedford Co. SAMUEL BROWN, Observer. — HUNTINGDON, Huntingdon County. JACOB MILLER, Obsr.

September, 1858.	Bedford Bar. Mean	Bedford Ther. Mean.	Bedford Prevail'g winds.	Huntingdon Bar. Mean	Huntingdon Ther. Mean	Huntingdon Rain.	Huntingdon Prevail'g winds
	Inch.	°		Inch.	°	Inch.	
1	29·109	68·0	N W.	29·307	66·3		E.
2	29·032	74·7	(var.)				S.
3	28·957	73 0	(var.)	29·139	71·7	0·131	W.
4	28·933	67.7	S W.	29·133	68 7		S W.
5				29·234	66·7		N W.
6	29·233	64·3	S W.	29·446	65·0		N.
7	29·305	67·0	S E.	29·510	69·0		S.
8	29·253	69·7	(var.)	29·440	68·0		S.
9	29·172	72·0	(var.)	29·357	73·7		S.
10	29·062	77·3	S W.	29·2[illegible]1	76·0	0·388	S.
11	29·017	67·0	N W.	29·220	68·0		N W.
12							N W.
13	29·261	57·3	(var.)	29·498	56·0		N.
14	29·279	60·3	S E.				S.
15	29 042	58·7	S E.	29·178	61·0	1·127	(var,)
16	28·758	61·7	N W.	28·888	61 7		N.
17	29·156	60·3	N W.				W.
18	29·411	55·7	N W.	29·635	56·3		(var.)
19				29·638	61·3		S.
20	29·369	67·3	S E.	29·559	66 3		S.
21	29·137	68·0	N W.	29·317	70·3		W.
22	29·176	56·0	N W.	29·420	56·0		N.
23	29·302	49 7	N W.	29·498	49·3	0·092	N W.
24	29·085	56·7	N W.	29·299	55·7	0·710	N.
25	29·306	55 0	N W.	29·527	56·0		(var.)
26				29·586	51·7		E.
27	29·426	50·3	S E.	29·632			E.
28	29·313	54·3	S E.	29·444	52·0		E.
29	29·100	60·7	S E.	29 276	62·0		E.
30	28·976	71·7	S W.	29·122	66·3		S.
Means						2·448	

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